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GRAY EAGLE MINE SITE

PRELIMINARY ASSESSMENT/SITE INSPECTION

FINAL REPORT

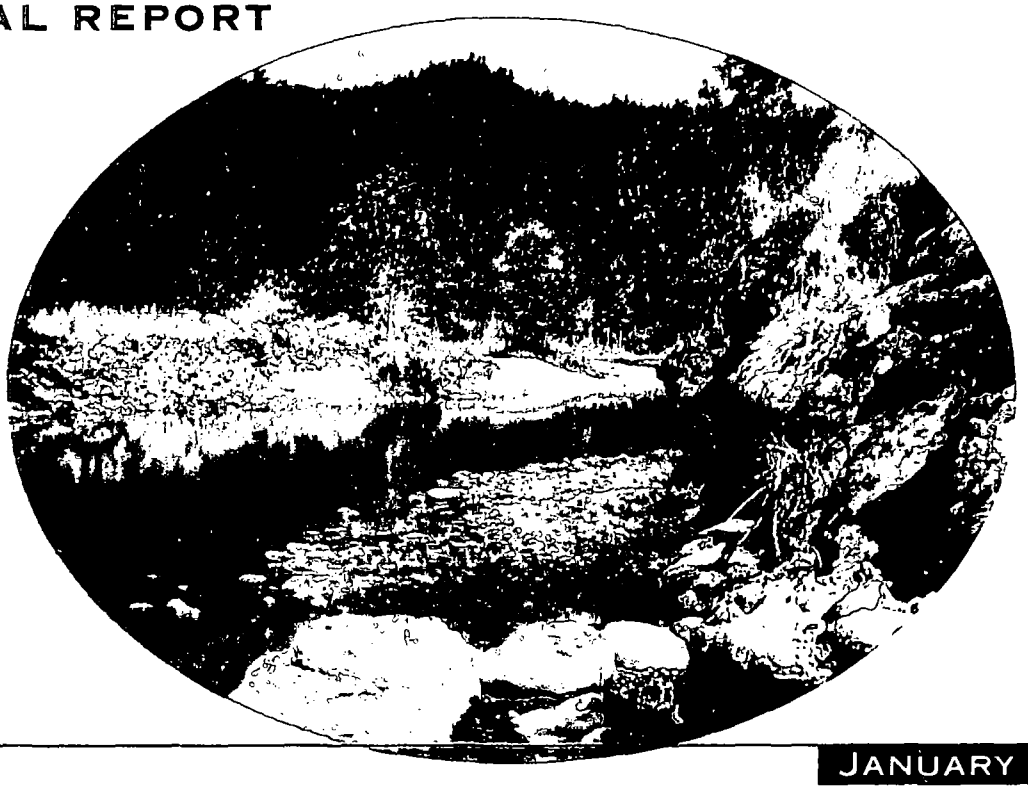

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Table of Contents

Section		Page
1	**Introduction**	1-1
2	**Apparent Problem**	2-1
3	**Site Description and History**	3-1
	3.1 Site Location	3-1
	3.2 Site Description	3-1
	3.3 Site History	3-2
4	**Regulatory Involvement**	4-1
	4.1 U.S. Environmental Protection Agency	4-1
	4.2 U.S. Department of Agriculture Forest Service (Forest Service)	4-1
	4.3 North Coast Regional Water Quality Control Board (NCRWQCB)	4-2
	4.4 California Department of Fish and Game (CDFG)	4-2
	4.5 California Department of Toxic Substances Control (DTSC)	4-2
5	**Summary of Investigative Efforts**	5-1
	5.1 Previous Investigations	5-1
	5.1.1 California Department of Game and Fish (CDFG)	5-1
	5.1.2 U.S. Environmental Protection Agency	5-2
	5.2 Current PA/SI Investigation	5-2
	5.2.1 Stream Sediment Sampling	5-3
	5.2.2 Surface Water Sampling	5-3
	5.2.3 Deviations From the Sampling and Analysis Plan	5-3
	5.3 Summary of Sampling Results	5-7
6	**Hazard Ranking System Factors**	6-1
	6.1 Sources of Contamination	6-1
	6.1.1 Grey Eagle Mine Tailings Pile	6-1
	6.1.2 AMD/Leachate From Grey Eagle Mine Tailings Pile	6-1
	6.1.3 AMD From the Grey Eagle Mine Via Luther Gulch	6-3
	6.2 Groundwater Pathway	6-3
	6.3 Surface Water Migration Pathway	6-4
	6.3.1 Hydrologic Setting	6-4
	6.3.2 Surface Water Pathway Sampling	6-4
	6.3.2.1 Luther Gulch	6-4
	6.3.2.2 Indian Creek	6-5

Table of Contents (Cont.)

Section **Page**

6.3.2.3 Klamath River 6-5
6.3.3 Surface Water Targets 6-6
6.3.3.1 Luther Gulch 6-6
6.3.3.2 Indian Creek 6-6
6.3.4 Surface Water Pathway Conclusions 6-7
6.4 Soil Exposure and Air Migration Pathways 6-7

7 Emergency Response Considerations 7-1

8 Summary 8-1

9 References 9-1

Appendices

A Analytical Results

B Ownership History

C Sampling and Analysis Plan

D Contact Log and Reports

List of Tables

Table		Page
5-1	Surface Water and Stream Sediment Samples Collected and Their Locations	5-6
5-2	Analytical Results of Sediment Sampling	5-7
5-3	Analytical Results of Water Sampling	5-8
6-1	Analytical Results of Seep/Leachate Water Sampling	6-2
6-2	Analytical Results of Seep/Leachate Sediment Sampling	6-2
6-3	Analytical Results of Water Sampling in Luther Gulch	6-3
6-4	Analytical Results of Sediment Sampling in Luther Gulch	6-3
6-5	Analytical Results of Water Sampling in Indian Creek	6-5
6-6	Analytical Results of Sediment Sampling in Indian Creek	6-5
6-7	Analytical Results of Water Sampling in Klamath River	6-6
6-8	Analytical Results of Sediment Sampling in Klamath River	6-6

List of Illustrations

Figures **Page**

5-1 Sampling Locations Map - Indian Creek Watershed 5-4

5-2 Sampling Locations Map - Grey Eagle Mine Tailings Site 5-5

1 Introduction

The U.S. Environmental Protection Agency (EPA), Region 9, under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), tasked Ecology and Environment, Inc.'s (E & E's) Superfund Technical Assessment and Response Team (START) to conduct a Preliminary Assessment/Site Inspection (PA/SI) of the Grey Eagle Mine Site (GE site) in Siskiyou County, California.

The site was identified by EPA in 1995 when members of the Karuk Indian Tribe living adjacent to, and downstream from, the GE site, met with a representative of the EPA (Rohde 1995). Karuk Tribe members requested that the EPA investigate the site and assess any potential environmental hazards.

The purpose of this PA/SI was to assess the GE site, to collect environmental samples, and to evaluate the site using the EPA's Hazard Ranking System (HRS). The HRS is the primary method of determining the site's eligibility for placement on EPA's National Priorities List (NPL). The NPL identifies sites at which the EPA may conduct remedial response actions.

2 Apparent Problem

The apparent problems at the site consist of the following:

- Arsenic, copper, and mercury from an on-site mine tailings pile have been released to Indian Creek, which is habitat for anadromous fish, including coho salmon (*Onchorhynchus kisutch*), fall chinook salmon (*Onchorhynchus tshawytscha*), and summer steelhead trout (*Onchorhynchus mykiss*), all federally threatened, endangered, or proposed endangered species (Forest Service 1997,1998a).
- As reported by the North Coast Regional Water Quality Control Board (NCRWQCB) and the California Department of Fish and Game (CDFG), the GE site is associated with historic releases that have caused fish kills and water quality problems related to acid mine drainage (AMD) in Indian Creek.

3 Site Description and History

3.1 Site Location

The GE site is about 5 miles north of the town of Happy Camp, Siskiyou County, California (Latitude 41° 51' 27" North, Longitude 123° 23' 54" West). The mine tailings pile is located on the east bank of Indian Creek, about 5.5 miles upstream of the confluence with the Klamath River, and about 0.2 mile south of the mouth of Luther Gulch in Sections 15, 16 and 22, Township 17 North, Range 7 East (see Figure 3-1, Site Location Map). The former Grey Eagle Mine is located about 1.5 miles northeast of the tailings pile, along Luther Gulch (USGS 1980).

3.2 Site Description

The site consists of the inactive Grey Eagle Mine, Luther Gulch below the mine to Indian Creek, and the tailings pile along the east bank of Indian Creek. The largest part of the tailings pile is located on private property, while a small amount are located on an adjacent 0.3-acre parcel of U.S. Forest Service land (Forest Service 1997). The main tailings pile measures about 12 acres, and exceeds 1,000 feet in east-west length and about 400 to 500 feet in north-south width. The pile is at least 20 to 25 feet deep across most of its area and contains an estimated 475,000 cubic yards of sulfide-rich mine tailings. The tailings pile is bounded on the south by a 10- to 13-feet high slope (E&E 1998a).

The area around the GE site is characterized by steep, heavily vegetated topography with coniferous and deciduous trees and a variety of shrub species predominating. About 30 percent of the watershed has undergone some degree of lumbering. The tailings pile is located at an elevation of about 1,360 feet above sea level, and the inactive Grey Eagle Mine is at an elevation of about 2,600 feet (Forest Service 1997).

The mine's mill, camp, and offices were formerly located about 2 miles up Luther Gulch Road near the headwaters of Luther Gulch, but have subsequently been removed (Forest Service 1997).

3.3 Site History

The history of mining the Grey Eagle deposit apparently dates back

to the 1890s when minor amounts of both vein and placer deposits were mined for gold, silver, and copper. From 1941 to 1945, the Grey Eagle Mining Company, a subsidiary of Newmont Mining Company, operated a small, underground mine that extracted the massive sulphide ore deposit (Mining World 1943, Newmont 1967).

Although mainly a copper mine, the Grey Eagle deposit also produced byproduct gold and silver. The ore was ground in mills to silt-sized particles, and conventional floatation methods were used to concentrate the ore. Following concentration, the sulphide tailings were transported by slurry pipe to their present location near the mouth of Luther Gulch along Indian Creek. It was during the World War II period of operations that the mine tailings were deposited. No tailings appear to have been deposited at the Indian Creek tailings site since 1945 (Mining World 1943, Forest Service 1997).

There does not appear to have been any mining activity at the GE site from 1945 until 1981. In 1981, during a period of high precious metals prices, Noranda Mining Company re-opened the Grey Eagle Mine and produced about 180,000 ounces of gold until the mine was closed in 1987. In 1952, a log pond was constructed on the tailings pile by the Willamette Lumber Company, the site's owner, as part of the saw mill operations conducted from 1945 until 1965 (Mining World 1943, Forest Service 1997, NCRWQCB 1997).

The private property for the former Grey Eagle Mine on Luther Gulch is currently owned by Siskon Gold Corporation, and the private property containing the majority of the mine tailings along Indian Creek is currently owned by William and Maxine McCoy, the former property caretaker for Siskon Gold Corporation (EPA 1996a, NCRWQCB 1997). The only ongoing activities at the site relate to operation and maintenance of an AMD treatment system on Luther Gulch (Forest Service 1996).

The ownership history of the mine and the tailings pile at the GE site is both long and complex. More complete ownership information is included in Appendix B.

4 Regulatory Involvement

4.1 U.S. Environmental Protection Agency

The Grey Eagle Mine tailings site is listed in EPA's CERCLA Information System with ID Number CAD000629923. The GE site is not listed in the Resource Conservation and Recovery Information System database.

In response to concerns of the Karuk Tribe in 1995, the START conducted an initial removal assessment on behalf of EPA's Office of Emergency Response (ERO) (EPA 1996b). The START assessment found that tailings, stream sediment, and surface water samples collected contained metals, including arsenic, copper, lead, and mercury, at concentrations significantly greater than those in background samples (E&E 1996).

Based on the 1996 findings, the START contracted a backhoe to assess the aerial extent and thickness of the tailings, their depth and degree of oxidation, and the depth of water below the tailings surface. Information collected as part of this 1998 investigation was used to plan a subsequent removal action by the ERO (E&E 1998a).

In September 1998, the ERO, the Emergency Rapid Response Serivces (ERRS) contractor, and the START conducted a removal action to address the tailings at the GE site that included the following objectives: removing tailings from the Forest Service property; re-contouring of tailings slopes and the log pond; installing rip-rap along the base of the tailings pile; capping the tailings with an impermeable cover (geo-membrane) and native soil; installing a drainage system; and re-vegetating the tailings (E&E 1998b).

4.2 U.S. Department of Agriculture Forest Service (Forest Service)

The Forest Service has CERCLA authority over the 0.3 acre of land it owns along Indian Creek (Forest Service 1998b). In March 1997, the Happy Camp Ranger District of the Klamath National Forest, published the "Indian Creek Watershed Analysis," a comprehensive study of the watershed's environment (Forest Service

1997). The Forest Service has assigned an On-Scene Coordinator to the site who monitored work conducted on it by the ERO in September 1998 (Forest Service 1999).

4.3 North Coast Regional Water Quality Control Board (NCRWQCB)

The NCRWQCB appears to have had regulatory involvement with the GE site continuously since 1952 (RWPCB 1952).

On May 11, 1981, the NCRWQCB adopted Waste Discharge Requirements (Order Nos. 81-51, 81-52, and 81-53) for Noranda Grey Eagle Mines, Inc., Noranda Inc., and Siskon Corporation related to the "continuous and chronic source" of acid mine discharge that "is toxic to all aquatic life in Luther Gulch Creek and has, at times, caused fish kills in Indian Creek over its five mile reach from Luther Gulch to Klamath River" (NCRWQCB 1981).

A Final Cleanup and Abatement Order (No. 97-116) was issued on November 17, 1997 by NCRWQCB to numerous parties having title to the property containing the tailings pile. The order required that the "dischargers shall cleanup and abate the discharge and threatened discharge," and perform certain other cleanup tasks. These include submission of a workplan, feasibility study, extent of contamination report, and a corrective action plan. In response to the Order, Noranda constructed an AMD treatment plant along Luther Gulch. The outflow from the treatment plant is currently monitored by the NCRWQCB (Forest Service 1996, NCRWQCB 1997, 1999).

4.4 California Department of Fish and Game (CDFG)

The CDFG actively regulated the site and conducted numerous sampling investigations at the site from the 1950s to the1990s (see Section 5.1.1). There is no current involvement by CDFG with the site (Forest Service 1999).

4.5 California Department of Toxic Substances Control (DTSC)

There does not appear to be any past or current involvement by DTSC with the site (Forest Service 1999).

5 Summary of Investigative Efforts

5.1 Previous Investigations

Because of the historic water quality impacts on Luther Gulch and Indian Creek that have been attributed to the Grey Eagle Mine and tailings pile, there have been numerous field investigations of the GE site since at least the 1950s.

5.1.1 California Department of Game and Fish (CDFG)

Water quality sampling conducted by CDFG in 1952, 1974, 1976, and 1981 appears to document that AMD from both Luther Gulch and the tailings pile were highly toxic or lethal to fish in Indian Creek. In November 1952, CDFG conducted a live anadromous fish trap study in which fish were placed in a trap in Indian Creek adjacent to the mine tailings and in another trap about 1 mile downstream of the tailings. The fish in the trap adjacent to the tailings suffered a high mortality rate, compared with the downstream trap that suffered none (CDFG 1952). A water sample collected from seepage at the old entrance to the Grey Eagle Mine shaft by CDFG in March 1967 reportedly contained a copper concentration of 74.92 milligrams per liter (CDFG 1967). On September 17, 1969, CDFG issued an internal memorandum describing a fish kill that occurred on September 11, 1969, in Indian Creek. The memorandum stated that "[i]t is evident that a complete kill of fish occurred in the 5.9 miles from the mouth of Luther Gulch to the Klamath River"(CDFG 1969a). A subsequent report by CDFG outlined the damage caused by the release and calculated the fish replacement costs (CDFG 1969b).

According to an internal memorandum dated March 19, 1970, CDFG billed The Standard Slag Company, the property owner of the Grey Eagle Mine at the time, $3,500 as the "negotiated replacement cost" for the fish killed in September 1969 (CDFG 1970).

In September 1974, CDFG collected 18 water samples, mainly from Luther Gulch, that contained up to 88 mg/L copper with pH as low as 3.1 (CDFG 1974). In April 1976, CDFG collected nine water samples from Luther Gulch that contained up to 237 mg/L copper and pH as low as 2.9 (CDFG 1976). In 1981, CDFG collected water and sediment samples from the leachate stream and documented pH levels ranging down to 3.2. In addition to total and dissolved iron and cadmium, the samples reportedly contained

concentrations of total and dissolved copper and zinc that significantly exceeded toxic benchmarks for fish (CDFG 1981).

5.1.2 U.S. Environmental Protection Agency

In addition to this PA/SI, the EPA, through its START contract, has conducted two prior investigations at the GE site.

In 1996, the START conducted a removal assessment on behalf of EPA's ERO that included collection of 34 tailings/soil samples, 10 stream sediment samples, and six surface water samples from the area around the tailings pile, leachate stream, and Indian Creek. The data from this investigation were used to characterize the mine tailings and also to assess on-going release of metals and AMD from the tailings pile into Indian Creek. Analyses of soil samples taken from the tailings detected concentrations of arsenic up to 1,150 milligrams per kilogram (mg/Kg), copper up to 3,640 mg/kg, and lead up to 48 mg/Kg. Analyses of surface water samples from the leachate stream detected concentrations of copper at 828 micrograms per liter (μg/L) with a pH of 3.1. In addition, a 96-hour bioassay study conducted on a water sample from the leachate stream documented a 100 percent mortality rate for trout fingerlings even after adjusting the sample's pH to 7.0 (E&E 1996).

Based on the above results, in August 1998, the START contracted a backhoe on behalf of EPA's ERO to excavate 10 exploratory trenches and pits on the tailings pile to estimate the aerial extent of tailings, the depth and degree of oxidation, depth of water beneath the tailings, and the thickness of the tailings. The START investigation determined that while the surface of the tailings have been oxidized, the majority of the sulfide tailings have undergone little alteration or weathering. The report concluded that, given its hydrologic and pH conditions, the tailings pile appeared capable of being a source of AMD and metals for many years (E&E 1998a).

5.2 Current PA/SI Investigation

In February 1999, EPA Region 9's States, Planning and Assessment Office tasked the START to conduct a PA/SI of the site. including the collection of additional environmental samples. The specific sampling objectives were to collect data that could be used to document whether a release of arsenic, copper, lead, mercury, or other contaminants (sulfates, sulfides, and total dissolved solids) has occurred to Indian Creek that can be attributed to the GE site. The field work was conducted in accordance with the START's "Grey Eagle Mine Site PA/SI Sampling and Analysis Plan" (SAP), submitted to the EPA in October 1999, and found in Appendix C of this report.

During October 12 to 14, 1999, the START conducted a sampling program to document whether the GE site is impacting Indian Creek. The START collected co-located stream sediment and surface water samples from Indian Creek, Luther Gulch, and the Klamath River as well as leachate samples adjacent to the tailings pile (see Table 5-1; Figure 5-1, Sample Location Map-Indian Creek Watershed; and Figure 5-2, Sample Location Map-Grey Eagle Mine Tailings Site).

5.2.1 Sediment Sampling

The START collected one sediment sample from Luther Gulch, four sediment samples from Indian Creek, three sediment samples from the Klamath River (including one duplicate sample), and six sediment samples (including one duplicate) from seep/leachate locations. Table 5-1 lists sediment samples and their locations. Results are summarized in Table 5-2.

The sediment samples were analyzed for total arsenic, copper, lead, and mercury through EPA's Contract Laboratory Program Analytical Services.

5.2.2 Water Sampling

The START collected one surface water sample from Luther Gulch, four surface water samples from Indian Creek, three surface water samples from the Klamath River (including one duplicate sample), and seven samples (including one duplicate) from seep/leachate locations. Wherever possible, surface water samples were co-located with sediment samples. One surface water sample (GE-W-1A) was collected from a background seep from which no sediment was available. Table 5-1 lists the sample numbers and their locations. Results are summarized in Table 5-3.

Water samples were analyzed for total and dissolved arsenic, copper, and lead by EPA Method 200.8; for low level mercury by EPA Method 1631-B; for total dissolved solids (TDS) by EPA Method 160.1; for sulfate by EPA Method 9056; for sulfide by EPA Method 9034; and for hardness by EPA Method 130.2.

5.2.3 Deviations From the Sampling and Analysis Plan

The field activities conducted by the START were performed in accordance with the EPA-approved SAP. The following deviations from the SAP are noted:

- Stream sediment was not available for collection at location GE-W-1A, a background groundwater seep flowing into Indian Creek about 1 mile upstream from the site.

- Because of time constraints, only one co-located sediment and water sample was collected between the tailings pile and the town of Happy Camp.

Base map source: *TOPO! Interactive Maps for Mount Shasta,Lassen Wilderness, and the Trinity Alps* (based on 1:24,000 USGS topographic quadrangles)

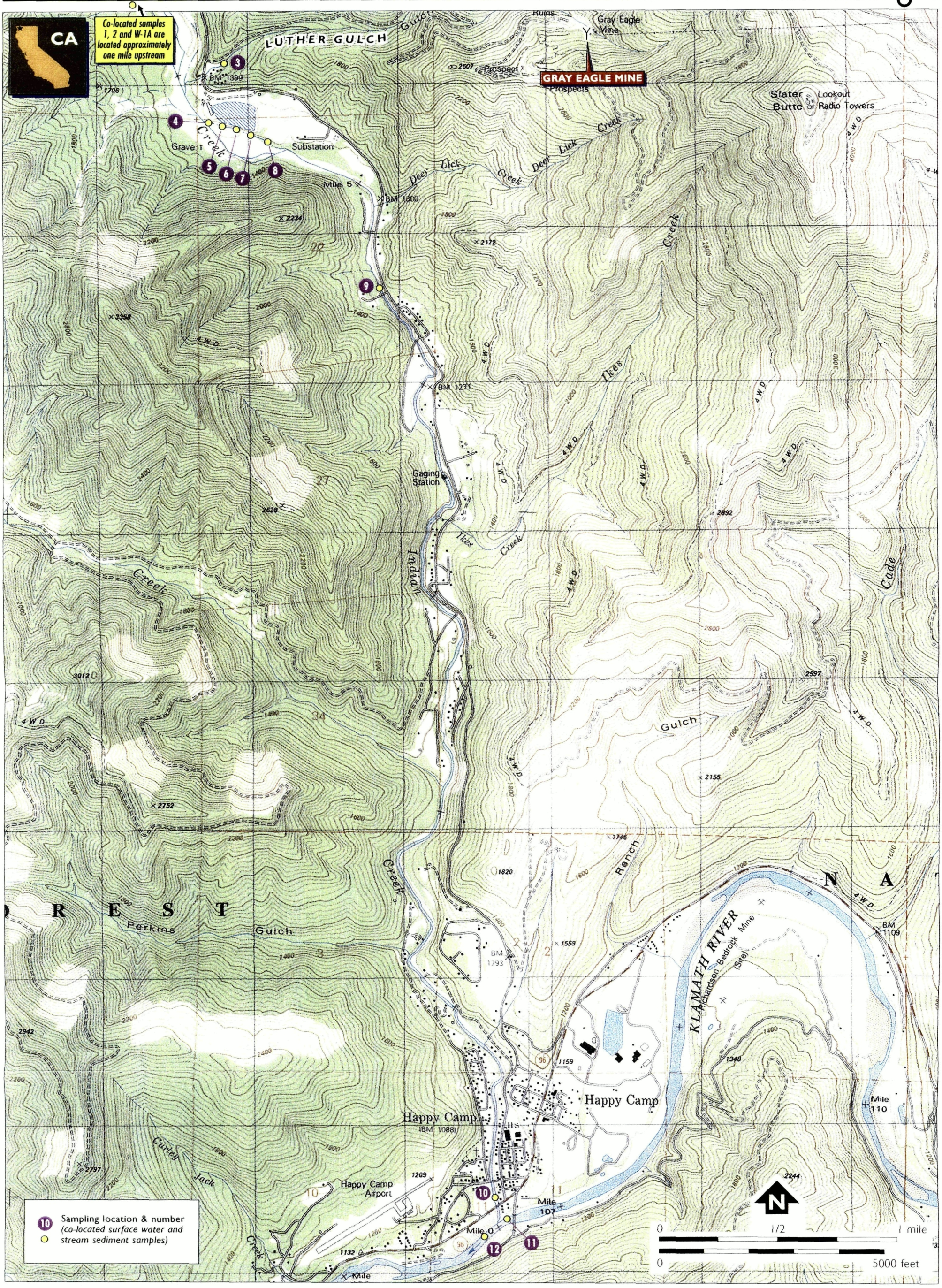

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Figure 5-1

Sampling Locations Map

Indian Creek Watershed

Klamath National Forest, Siskiyou County, California

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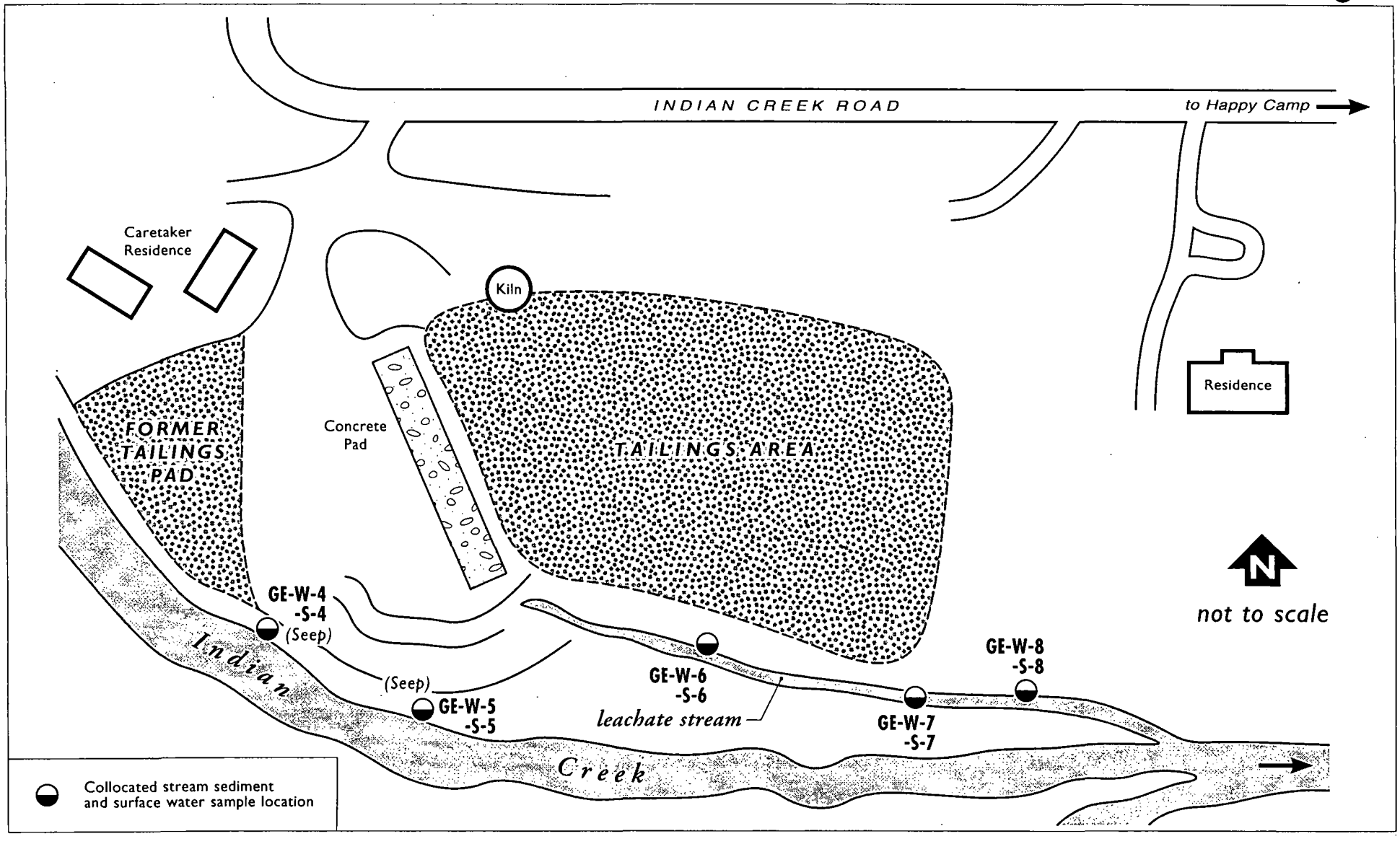

Figure 5-2

Sampling Locations Map

Grey Eagle Mine Tailings Site

Siskiyou County, California

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Table 5-1 Surface Water (W) and Stream Sediment (S) Samples Collected and Their Locations

Sample No.	Sample Location	Notes
GE-W/S-1	Indian Creek, upstream of Luther Gulch	Background sample for Indian Creek
GE-W-1A	Background seep	Water only, no sediment, and no low-level Hg analysis
GE-W/S-2	Indian Creek, upstream of Luther Gulch	Background sample for Indian Creek
GE-W/S-3	Luther Gulch	Sample downstream of Grey Eagle Mine
GE-W/S-4	Seep adjacent to tailings pile	Active seep at base of tailings pile
GE-W/S-5	Seep adjacent to tailings pile	Active seep at base of tailings pile
GE-W/S-6	Leachate stream	Leachate stream at base of tailings pile
GE-W/S-7	Leachate stream	Leachate stream at base of tailings pile
GE-W/S-8	Leachate stream	Leachate stream at base of tailings pile
GE-W/S-9	Indian Creek, about 0.8 mile below tailings	Downstream sample from the GE site
GE-W/S-10	Indian Creek above outfall to Klamath River	Test water quality of discharge into the Klamath river
GE-W/S-11	Klamath River above Indian Creek	Background sample for discharge from Indian Creek into Klamath River
GE-W/S-12	Klamath River below Indian Creek	Test the influence of Indian Creek discharge on Klamath River
GE-W/S-14	Leachate stream	Duplicate of GE-W/S-8
GE-W/S-15	Klamath River below Indian Creek	Duplicate of GE-W/S-12
GE-W-16	At field staging area	Field blank sample - water only, no sediment, no low-level Hg analysis

5.3 Summary of Sampling Results

Field activities were completed on October 14, 1999. Analytical results for total and dissolved metals, mercury, and hardness were validated during December 1999 by the START. Analyses of dissolved metals in water samples indicate that the results are consistent with total metals values. In general, water hardness (as calcium carbonate) was elevated in samples collected adjacent to the tailings pile and from the background seep.

The data validation conducted by the START determined that the data were of definitive quality and met the objectives described in the SAP. The analytical results and data review summaries are contained in Appendix A of this report.

In general, the results of this sampling program are consistent with the results of previous sampling conducted by the START and others.

Table 5-2 Analytical Results of Sediment Sampling, in mg/Kg

Sample No.	Arsenic	Copper	Lead	Mercury
GE-S-1 (Indian Creek)	2.2 (J)	32	2.5 (J)	ND (0.06)
GE-S-2 (Indian Creek)	2.2 (J)	46	1.9 (J)	ND (0.06)
GE-S-3 (Luther Gulch)	6.2	210	2.7 (J)	ND (0.05)
GE-S-4 (seep)	5.3	84	4.7 (J)	ND (0.07)
GE-S-5 (seep)	25	63	0.52 (J)	ND (0.06)
GE-S-6 (leachate stream)	32	140	2.8 (J)	ND (0.08)
GE-S-7 (leachate stream)	110	76	2.4 (J)	ND (0.18)
GE-S-8 (leachate stream)	39	24 (J)	ND (0.83)	ND (0.34)
GE-S-9 (Indian Creek)	2.0 (J)	38	1.6 (J)	ND (0.05)
GE-S-10 (Indian Creek)	3.6	56	2.5 (J)	ND (0.04)
GE-S-11 (Klamath River)	2.0 (J)	17	1.4 (J)	ND (0.06)
GE-S-12 (Klamath River)	2.2 (J)	32	1.7 (J)	ND (0.06)
GE-S-14 (dup. of S-8)	39	75	1.4 (J)	ND (0.41)
GE-S-15 (dup. of S-12)	2.1 (J)	31	1.6 (J)	ND (0.06)

ND = Not detected (detection limit in parentheses)

(J) = The associated value is an estimated quantity.

Table 5-3 Analytical Results of Water Sampling - Total Metals

Sample No.	Arsenic µg/L	Copper µg/L	Lead µg/L	Mercury ng/L
GE-W-1 (Indian Creek)	ND (0.5)	0.27	0.04	ND (0.200)
GE-W-2 (Indian Creek)	ND (0.5)	0.38	0.06	ND (0.200)
GE-W-1A (Bkgd seep)	1.1	3.80	0.06	N/A
GE-W-3 (Luther Gulch)	0.6	7.87	0.03	0.980
GE-W-4 (seep)	ND (0.5)	124	0.03	ND (0.200)
GE-W-5 (seep)	12.6	0.65	0.03	ND (0.200)
GE-W-6 (leachate stream)	2.5	27.6	0.06	0.680
GE-W-7 (leachate stream)	59.1	12.1	0.11	11.900
GE-W-8 (leachate stream)	4.0	10.3	0.02	ND (0.200)
GE-W-9 (Indian Creek)	ND (0.5)	0.32	ND (0.02)	0.240 (J)
GE-W-10 (Indian Creek)	ND (0.5)	0.29	ND (0.02)	ND (0.200)
GE-W-11 (Klamath River)	4.7	0.58	0.04	1.110
GE-W-12 (Klamath River)	ND (0.5)	0.31	ND (0.02)	0.460
GE-W-14 (dup. of W-8)	3.9	9.73	0.02	0.220 (J)
GE-W-15 (dup. of W-12)	ND (0.5)	0.33	ND (0.02)	0.400 (J)
GE-W-16 (field blank)	ND (0.5)	ND (0.10)	ND (0.02)	N/A

mg/L = milligrams per liter

ng/L = nanograms per liter

ND = Not detected (detection limit in parentheses)

N/A = Sample for mercury not collected

(J) = The associated value is an estimated quantity

6 Hazard Ranking System Factors

6.1 Sources of Contamination

The GE site has been investigated for its impacts on the environment since the 1950s by agencies including CDFG, NCRWQCB, the Forest Service, and EPA. Sampling conducted to date has documented that the mine and tailings pile are sources of hazardous substances, including arsenic, copper, lead, and mercury.

Three sources of hazardous substances have been identified and are described below.

6.1.1 Grey Eagle Mine Tailings Pile

The tailings pile is located along the east bank of Indian Creek and measures about 1,000 feet east-west, by about 500 feet wide north-south, and is about 20 to 25 feet deep across most of its area. The volume of tailings is estimated to be about 475,000 cubic yards. Soil sampling of the tailings conducted previously has documented significantly elevated levels of metals, including arsenic, copper, mercury, and lead (E&E 1998a).

In 1996, the START conducted a removal assessment on behalf of EPA that included collection of 34 soil/tailings samples from the area around the tailings pile, leachate stream, and Indian Creek. Samples taken from the tailings contained concentrations of arsenic up to 1,150 mg/Kg, copper up to 3,640 mg/kg, and lead up to 48 mg/Kg, and mercury up to 5.9 mg/Kg (E&E 1996).

6.1.2 AMD/Leachate From Grey Eagle Mine Tailings Pile

AMD is caused by the natural oxidation of sulfide minerals contained in ore, waste rock, and tailings when they become exposed to air and/or water. The reactions that produce AMD are often accelerated by microbiological activity. The most common sulfide mineral that oxidizes to produce AMD is pyrite (iron disulfide), although other economic sulfide minerals can oxidize to produce AMD. As discussed previously, the tailings pile contains about 475,000 cubic yards of sulfide-rich tailings. Trenching across the tailings pile during the dry season documented a water table at about 10 feet below ground surface, indicating a saturated zone of tailings of at least 10 feet in thickness (E&E 1998a). This water is acidic and contains elevated levels of metals.

Samples GE-W-4 and -5 were collected from seeps that occur at the base of the contact between the tailings pile and the Indian Creek river channel deposits. The seep flow at sample locations

GE-W-4 and -5 was light, probably not exceeding 2 to 3 gallons per minute, although seep flow during the winter wet season is probably considerably higher.

Surface water samples GE-W-6, -7, and -8 were collected in the leachate stream, a shallow west-to-east-flowing channel of a maximum 6 to 8 feet in width and few hundred feet in length. It is a conduit for the discharge of leachate from the tailings pile into Indian Creek. The leachate stream contains abundant red to orange iron oxide ooze, or flocculant, and has been documented to contain low pH water and elevated levels of metals.

An analysis of a surface water sample (IC-3) taken from the leachate stream by the START in 1996 detected a copper concentration of 828μg/L and a pH of 3.1. In addition, a 96-hour bioassay study conducted on this leachate stream sample documented a 100 percent mortality rate for trout fingerlings, even after adjusting the sample's pH to 7.0 (E&E 1996).

Analytical results of seep and leachate sampling is shown in Table 6-1.

Table 6-1 Analytical Results of Seep/Leachate Water Sampling, Total Metals

Sample No.	Arsenic μg/L	Copper μg/L	Lead μg/L	Mercury ng/L
GE-W-1A (Bkgd seep)	1.1	3.80	0.06	N/A
GE-W-4 (seep)	ND (0.5)	124	0.03	ND (0.200)
GE-W-5 (seep)	12.6	0.65	0.03	ND (0.200)
GE-W-6 (leachate stream)	2.5	27.6	0.06	0.680
GE-W-7 (leachate stream)	59.1	12.1	0.11	11.900
GE-W-8 (leachate stream)	4.0	10.3	0.02	ND (0.200)

ND = Not detected (detection limit in parentheses)

NA = Sample for mercury not collected

Table 6-2 Analytical Results of Seep/Leachate Sediment Sampling, Metals in mg/Kg

Sample No.	Arsenic	Copper	Lead	Mercury
GE-S-4	5.3	84	4.7 (J)	ND (0.07)
GE-S-5	25	63	0.52 (J)	ND (0.06)
GE-S-6	32	140	2.8 (J)	ND (0.08)
GE-S-7	110	76	2.4 (J)	ND (0.18)
GE-S-8	39	24 (J)	ND (0.83)	ND (0.34)
GE-S-14 (dup. of S-8)	39	75	1.4 (J)	ND (0.41)

ND = Not detected (detection limit in parentheses)

(J) = The associated value is an estimated quantity.

6.1.3 AMD From the Grey Eagle Mine Via Luther Gulch

AMD also originates from the flow of groundwater through the old Grey Eagle Mine adits and underground workings, currently covered by mining wastes produced during the period of gold mining in the 1980s. The AMD then flows into Luther Gulch, a small, west-flowing tributary of Indian Creek that drains the watershed in which the inactive Grey Eagle Mine is located. As discussed in Section 5, the Grey Eagle Mine, from which the tailings pile located on Indian Creek was derived, has been associated with chronic, historic releases of AMD via Luther Gulch. Past releases of AMD have resulted in fish kills and severe water quality problems in Luther Gulch, and in Indian Creek downstream to the Klamath River. Following construction in 1987 of a water treatment plant in Luther Gulch in response to a cleanup order from the NCRWQCB (see Section 4.3), there have been no reported water quality problems associated with Luther Gulch's discharge into Indian Creek (NCRWQCB 1999).

Analytical results for surface water and sediment samples from Luther Gulch are shown in tables 6-3 and 6-4. The results for water sample GE-W-3 indicate that the levels of arsenic, copper, lead and mercury at the time of sampling met EPA's ambient water quality criteria.

Table 6-3 Analytical Results of Water Sampling in Luther Gulch, Total Metals

Sample No.	Arsenic µg/L	Copper µg/L	Lead µg/L	Mercury ng/L
AWQC (a)	190	12	3.2	12
GE-W-3 (Luther Gulch)	0.6	7.87	0.03	0.980

(a) = EPA Ambient Water Quality Criteria, Freshwater-Chronic

Table 6-4 Analytical Results of Sediment Sampling in Luther Gulch, in mg/Kg

Sample No.	Arsenic	Copper	Lead	Mercury
GE-S-3	6.2	210	2.7 (J)	ND (0.05)

ND = Not detected (detection limit in parentheses)

(J) = The associated value is an estimated quantity.

6.2 Groundwater Pathway

The site is located within the Indian Creek watershed. Trenching conducted by the START across the tailings pile in August 1998 encountered water at about 10 feet below ground surface (E&E 1998a) At several locations along the bank of the tailings pile, leachate flows from the base of the tailings pile as seeps at, or near, the contact between the tailings and the underlying Indian Creek river deposits. Two of these seeps were sampled as part of this investigation (see tables 6-1 and 6-2).

There is no known use of groundwater for drinking purposes, either in the vicinity of the site or in Happy Camp, the nearest town.

Happy Camp obtains its drinking water from Elk Creek, a tributary of the Klamath River (Forest Service 1999).

6.3 Surface Water Migration Pathway

6.3.1 Hydrologic Setting

The site lies within the lower reach of the Indian Creek watershed (See Figure 5-1). Indian Creek flows about 5 miles to the south from the site where it empties into the Klamath River, which flows to the west about 35 miles where it discharges into the Pacific Ocean (Forest Service 1997).

The probable points of entry for contaminants from the GE site to Indian Creek are:

- AMD via Luther Gulch
- Discharges from tailings pile via seeps and the leachate stream (See Figure 5-2).

The Indian Creek watershed lies in the heart of the Klamath Physiographic Province, an area of nearly 10 million acres that encompasses the Klamath and Siskiyou Mountains. Indian Creek watershed consists of about 86,200 acres, mostly in California, with a small portion extending into southern Oregon. Topography in the watershed is rugged and mountainous with elevations ranging from about 1,100 feet at the mouth of Indian Creek to about 7,000 feet along the western border of the watershed (Forest Service 1997).

The U.S. Geological Survey maintains a stream flow gauge about 4 miles upstream from the mouth of Indian Creek. According to a 1997 Forest Service report, stream flow during the summer low-flow months averages about 40 cubic feet per second (cfs); average annual flow is about 400 cfs; storm flow with a return probability of "once in a few years" is about 4,000 cfs; and peak discharge during the historic 1964 flood was estimated at 40,000 cfs. Approximately half of the total discharge in Indian Creek occurs during runoff associated with storms (Forest Service 1997).

6.3.2 Surface Water Pathway Sampling

START sampled surface waters and sediments in Luther Gulch, Indian Creek, and the Klamath River.

6.3.2.1 Luther Gulch

As noted in Section 6.1.3, START collected one surface water sample and one sediment sample from Luther Gulch downstream of the AMD treatment system.

The results for water sample GE-W-3 indicate that the levels of arsenic, copper, lead and mercury at the time of sampling met EPA's ambient water quality criteria (AWQC). The copper concentration for GE-S-3 (210 mg/Kg) exceeds National Oceanic and Atmospheric Administration's (NOAA) ecological benchmark of 34

mg/Kg. A background sampling location upstream of the mine was not available.

6.3.2.2 Indian Creek

START collected two surface water samples and two sediment samples each from Indian Creek upstream of Luther Gulch and the tailings pile, and from Indian Creek downstream of the tailings pile. Analytical results for water and sediment samples collected in Indian Creek are presented in tables 6-5 and 6-6 respectively. Additionally, as noted in Section 6.1.2, START collected leachate samples from two seeps.

As shown in Table 6-1, leachate sample GE-W-4 contained copper at 124 μg/L, and sample GE-W-5 contained 12.6 μg/L arsenic. A release of copper and arsenic to Indian Creek was documented because the seeps were observed by START to discharge directly into Indian Creek.

The analytical results for surface water and sediment samples collected from Indian Creek indicate that by sample location GE-W/S-9, about 1 mile downstream from the GE site, the effects of the metals contamination have attenuated to background levels. Arsenic, copper, lead, and mercury concentrations in water samples were below AWQC. The concentrations of these metals in sediment samples were below NOAA ecological benchmarks.

Table 6-5 Analytical Results of Water Sampling in Indian Creek, Total Metals

Sample No.	Arsenic μg/L	Copper μg/L	Lead μg/L	Mercury ng/L
AWQC (a)	190	12	3.2	12
GE-W-1 (Background)	ND (0.5)	0.27	0.04	ND (0.200)
GE-W-2 (Background)	ND (0.5)	0.38	0.06	ND (0.200)
GE-W-9	ND (0.5)	0.32	ND (0.02)	0.240 (J)
GE-W-10	ND (0.5)	0.29	ND (0.02)	ND (0.200)

(a) = EPA Ambient Water Quality Criteria, Freshwater-Chronic, copper and lead unadjusted for hardness
ND = Not detected (detection limit in parentheses)
(J) = The associated value is an estimated quantity.

Table 6-6 Analytical Results of Sediment Sampling in Indian Creek, Metals in mg/Kg

Sample No.	Arsenic	Copper	Lead	Mercury
SQRT-ERL (a)	8.2	34	46.7	0.15
GE-S-1(Background)	2.2 (J)	32	2.5 (J)	ND (0.06)
GE-S-2 (Background)	2.2 (J)	46	1.9 (J)	ND (0.06)
GE-S-9	2.0 (J)	38	1.6 (J)	ND (0.05)
GE-S-10	3.6	56	2.5 (J)	ND (0.04)

(a) = NOAA Screening Quick Reference Tables, Effects Range-Low
ND = Not detected (detection limit in parentheses)
(J) = The associated value is an estimated quantity.

6.3.2.3 Klamath River

Concentrations of arsenic, copper, lead, and mercury in the water and sediment samples collected from the Klamath River downstream of its confluence were not elevated relative to those collected upstream (See tables 6-7 and 6-8). Arsenic, copper, lead, and mercury concentrations in water samples were below AWQC. The concentrations of these metals in sediment samples were below NOAA ecological benchmarks. At the time of sampling, the releases of metals from the seeps and leachate stream into Indian Creek did not have a measurable impact on the Klamath River.

Table 6-7 Analytical Results of Water Sampling in Klamath River Total Metals

Sample No.	Arsenic µg/L	Copper µg/L	Lead µg/L	Mercury ng/L
AWQC (a)	190	12	3.2	12
GE-W-1 (Background)	ND (0.5)	0.27	0.04	ND (0.200)
GE-W-2 (Background)	ND (0.5)	0.38	0.06	ND (0.200)
GE-W-11	4.7	0.58	0.04	1.110
GE-W-12	ND (0.5)	0.31	ND (0.02)	0.460

(a) = EPA Ambient Water Quality Criteria, Freshwater-Chronic, copper and lead unadjusted for hardness

ND = Not detected (detection limit in parentheses)

N/A = Sample for mercury not collected

Table 6-8 Analytical Results of Sediment Sampling in the Klamath River in mg/Kg

Sample No.	Arsenic	Copper	Lead	Mercury
SQRT -ERL (a)	8.2	34	46.7	0.15
GE-S-1 (Background)	2.2 (J)	32	2.5 (J)	ND (0.06)
GE-S-2 (Background)	2.2 (J)	46	1.9 (J)	ND (0.06)
GE-S-11	2.0 (J)	17	1.4 (J)	ND (0.06)
GE-S-12	2.2 (J)	32	1.7 (J)	ND (0.06)

(a) = NOAA Sreening Quick Reference Tables- Effects Range-Low

ND = Not detected (detection limit in parentheses)

(J) = The associated value is an estimated quantity.

6.3.3 Surface Water Targets

6.3.3.1 Luther Gulch

Given its extensive history of water quality problems, anadromous and other kinds fish are not known to occur in Luther Gulch and there are no other sensitive environments associated with it. In addition, water from Luther Gulch has no known use for drinking water purposes.

6.3.3.2 Indian Creek

Indian Creek and its tributaries are the source of domestic and irrigation water for single-family residences (Forest Service 1997). The on-site residents obtain their water from Indian Creek upstream of Luther Gulch. Happy Camp obtains its drinking water from Elk

Creek, a tributary of the Klamath River several miles away (Forest Service 1999). According to data from the 1990 U.S. Bureau of the Census, there are 850 people living within 4 miles of the GE site (EPA 1999).

According to the Forest Service, Indian Creek and the Klamath River are a habitat to anadromous fish, including coho salmon (*Onchorhynchus kisutch*), fall chinook salmon (*Onchorhynchus tshawytscha*), and summer steelhead trout (*Onchorhynchus mykiss*), all federally threatened, endangered, or proposed endangered species (Forest Service 1997, 1998a). Reliable information regarding recreational or subsistence fishing in Indian Creek was not available. According to the EPA Geographic Information System Center, there is a habitat for the northern spotted owl (*Strix occidentalis caurina*) within 0.5 mile of the tailings pile (EPA 1999).

6.3.4 Surface Water Pathway Conclusions

A release of arsenic and copper has been documented from the seeps to Indian Creek. The release was documented because seeps adjacent to the tailings pile contained arsenic and copper and were observed to discharge directly into Indian Creek.

Indian Creek is a habitat for coho salmon, fall chinook salmon, and summer steelhead trout, all federally threatened, endangered, or proposed endangered species (Forest Service 1997, 1998a).

6.4 Soil Exposure and Air Migration Pathways

Samples collected by START in 1996 from the tailings contained concentrations of arsenic up to 1,150 mg/Kg, copper up to 3,640 mg/kg, and lead up to 48 mg/Kg, and mercury up to 5.9 mg/Kg (E&E 1996). In September 1998, the ERO, the ERRS contractor, and the START conducted a removal action to address the tailings at the GE site that included the following objectives: removing tailings from the Forest Service property; re-contouring of tailings slopes and the log pond; installing rip-rap along the base of the tailings pile; capping the tailings with an impermeable cover (geo-membrane) and native soil; installing a drainage system; and re-vegetating the tailings (E&E 1998b).

The nearest residents are the property owners whose home is several hundred feet away from the tailings. In addition, there are no schools, day care centers. According to the 1990 U.S. Census, there are 850 people living within 4 miles of the GE site (EPA 1999). Capping and revegatation of the tailings should minimize the potential for direct exposure or an air release.

7 Emergency Response Considerations

The National Contingency Plan [40 CFR 300.415(b)(2)] authorizes the EPA to consider emergency response actions at those sites that pose an imminent threat to human health or the environment. A referral to EPA Region 9's ERO does not appear necessary because the removal action it conducted in 1998 appears to have mitigated the imminent threats to the environment posed by the site.

8 Summary

The Grey Eagle Mine (GE) site is about 5 miles north of the town of Happy Camp, Siskiyou County, California. The site consists of three main sources: acid mine drainage (AMD) from the inactive Grey Eagle Mine via Luther Gulch; a mine tailings pile; and seeps/leachate from the tailings pile. The mine tailings pile is located on the east bank of Indian Creek, about 5.5 miles upstream from its confluence with the Klamath River, and about 0.2 mile south of the mouth of Luther Gulch. The old Grey Eagle Mine is located about 1.5 miles northeast of the tailings pile, along Luther Gulch.

The tailings pile contains an estimated 475,000 cubic yards of sulfide-rich mine tailings located adjacent to Indian Creek and within the active flood plain. The tailings are at long-term risk of being swept into the creek by high flows associated with rainstorms or flooding. The release of mining wastes from this site are associated with historic fish kills and severe water quality problems in both Luther Gulch and in Indian Creek.

The site's ownership and operational history is complex. The Grey Eagle Mine tailings were generated between 1941 to 1945 from a small, underground copper mine. The ore was milled and conventional floatation methods were used to concentrate the ore, then the sulphide tailings were transported by slurry pipe to their present location near the mouth of Luther Gulch along Indian Creek. There does not appear to have been any mining activity at the site from 1945 until 1981. In 1981, the Grey Eagle mine was re-opened as a gold mine and operations resumed until the mine closed in 1987. Mining wastes from this episode were managed at the mine site. In 1952, a log pond was constructed on the tailings pile by the site's owner as part of the saw mill operations conducted from 1945 until 1965. In 1987, a water treatment plant was built on Luther Gulch under a cleanup order from the North Coast Regional Water Quality Control Board (NCRWQCB), and there have not been any reported water quality problems in Luther Gulch since that time.

The site is currently under the regulatory authority of the NCRWQCB, the U.S. Department of Agriculture Forest Service (Forest Service), and the U.S. Environmental Protection Agency (EPA).

8. Sample Identification, Documentation and Shipment

A release of arsenic and copper has been documented from the seeps to Indian Creek. The release was documented because seeps adjacent to the tailings pile contained arsenic and copper and were observed to discharge directly into Indian Creek.

Samples collected approximately 1 mile downstream of the tailings pile do not contain significantly elevated levels of metals. The levels of arsenic, copper, lead, and mercury in surface waters and sediments in Indian Creek and the Klamath River downstream of the site do not exceed EPA's ambient water quality criteria or the National Oceanic and Atmospheric Administrations ecological benchmarks, respectively.

The following are the most significant HRS considerations associated with the Grey Eagle Mine Site:

- The largest source is the Grey Eagle Mine tailings pile which consists of about 475,000 cubic yards of sulfide-rich mine tailings located within an active flood plain.
- A release of arsenic and copper has been documented from the seeps to Indian Creek. The release was documented because seeps adjacent to the tailings pile contained arsenic and copper and were observed to discharge directly into Indian Creek.
- Indian Creek is a habitat for coho salmon (*Onchorhynchus kisutch*), fall chinook salmon (*onchorhynchus tshawytscha*), and summer steelhead trout (*Onchorhynchus mykiss*), all federally threatened, endangered, or proposed endangered species.
- There are no known drinking water wells in the vicinity of the site.
- There are no residents, schools, or day care centers located on areas of known soil contamination.
- According to the 1990 U.S. Census, there are 850 people living within 4 miles of the site.

9 References

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9. References

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A Analytical Results

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	**Location: Siskiyou County, California**
Project TDD Number: 09-9902-0022	**PAN: 0402-GEST-XX**
Laboratory: Columbia Analytical Services	**Lab Project Number: K99077382**
Sampling Dates: 10/13/99-10/14/99	**Sample Matrix: Water**
Analytical Method: *METALS (200.8)*	**Data Reviewer: Julio Paredes/Rich Amano**

REVIEW AND APPROVAL:

Data Reviewer: _____ **Date:** 12/29/99

Technical QA Reviewer: Edward Long **Date:** 1/28/00

Project Manager: _____ **Date:** 1/28/00

SAMPLE IDENTIFICATION:

Sample No.	Sample I.D.	Laboratory I.D.
1	GE-W-1	K9907382-001
2	GE-W-1 (DISSOLVED)	K9907382-001DISS
3	GE-W-1A	K9907382-002
4	GE-W-1A (DISSOLVED)	K9907382-002DISS
5	GE-W-2	K9907382-003
6	GE-W-2 (DISSOLVED)	K9907382-003DISS
7	GE-W-3	K9907382-004
8	GE-W-3 (DISSOLVED)	K9907382-004DISS
9	GE-W-4	K9907382-005
10	GE-W-4 (DISSOLVED)	K9907382-005DISS
11	GE-W-5	K9907382-006
12	GE-W-5 (DISSOLVED)	K9907382-006DISS
13	GE-W-6	K9907382-007
14	GE-W-6 (DISSOLVED)	K9907382-007DISS
15	GE-W-7	K9907382-008
16	GE-W-7 (DISSOLVED)	K9907382-008DISS
17	GE-W-8	K9907382-009
18	GE-W-8 (DISSOLVED)	K9907382-009DISS
19	GE-W-8D	K9907382-009D
20	GE-W-8S	K9907382-009S
21	GE-W-9	K9907382-0010
22	GE-W-9 (DISSOLVED)	K9907382-0010DISS
23	GE-W-10	K9907382-0011

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

25	GE-W-11	K9907382-0012
26	GE-W-11(DISSOLVED)	K9907382-0012DISS
27	GE-W-12	K9907382-0013
28	GE-W-12 (DISSOLVED)	K9907382-0013DISS
29	GE-W-14	K9907382-0014
30	GE-W-14D	K9907382-0014D
31	GE-W-14 (DISSOLVED)	K9907382-0014DISS
32	GE-W-14S	K9907382-0014S
33	GE-W-15	K9907382-0015
34	GE-W-15 (DISSOLVED)	K9907382-015DISS
35	GE-W-16	K9907382-016
36	GE-W-16 (DISSOLVED)	K9907382-016DISS

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

DATA PACKAGE COMPLETENESS CHECKLIST:

Checklist Code:

X	Included: no problems
*	Included: problems noted in review
O	Not Included and/or Not Available
NR	Not Required
RS	Provided As Re-submission

Case Narrative:

X	Case Narrative present

Quality Control Summary Package:

X	Data Summary sheets
X	Initial and Continuing Calibration results
X	CRDL Standard results
X	Preparation Blank and Calibration Blank results
NR	ICP Interference Check Sample results
X	Matrix Spike recoveries
X	Matrix Duplicate results
X	Laboratory Control Sample recoveries
NR	Method of Standard Additions results
NR	ICP Serial Dilution results
X	Instrument Detection Limits
NR	ICP Interelement Correction Factors
X	ICP Linear Ranges
X	Preparation Log
X	Analysis Run Log

Raw QC Data Package Section

X	Chain-of-Custody Records
X	Instrument Printouts
X	Sample Preparation Notebook Pages
X	Logbook and Worksheet Pages
NR	Percent Solids Determination

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

DATA VALIDATION SUMMARY

The data were reviewed following procedures and limits specified in the EPA OSWER directive, *Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan and Data Validation Procedures* (EPA/540/G-90/004, OSWER Directive 9360.4-01, dated April 1990).

Indicate with a YES or NO whether each item is acceptable:

1	Holding Times	YES
2	Initial and Continuing Calibrations	YES
3	Laboratory Control Sample	YES
4	Matrix Spike	YES
5	Blanks and Background Samples	YES
6	Duplicate Analyses	YES
7	Inductively Coupled Plasma QC	YES
8	Furnace Atomic Absorption QC	NR
9	Analyte Quantitation	YES
10	Overall Assessment of Data	YES
11	Usability of Data	YES

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

1. HOLDING TIMES

___X___ Acceptable
_____ Acceptable with qualification
_____ Unacceptable

Samples were extracted and analyzed within required holding times except as noted under Comments. In addition, no problems were identified with regard to sample preservation or custody unless specified. For those samples analyzed outside holding time requirements, the detected results have been qualified as estimated (J), and the nondetected results have been qualified either as estimated (UJ) or rejected (R) based on the reviewer's judgement.

All Sample Matrices:
Mercury: 28 days (from collection) for analysis.
Hexavalent chromium: 24 hours (from collection) for analysis.
All other metals: 180 days (from collection) for analysis.

Comments: None

2. INITIAL AND CONTINUING CALIBRATION VERIFICATION

___X___ Acceptable
_____ Acceptable with qualification
_____ Unacceptable

Unless flagged below, an initial calibration verification (ICV) and a calibration blank were analyzed at the beginning of the run, and a continuing calibration verification (CCV) and a calibration blank were analyzed after every ten samples, and at the end of the run. ICV and CCV recoveries were within a range of 80-120% for mercury and tin, and 90-110% for all other metals. For analytes which exceeded these control limits, associated detected results are qualified as estimated (J). In cases where the recovery was below 65% or above 135% (for mercury and tin) or below 75% or above 125% (for all other metals), all associated data are rejected (R).

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

3. LABORATORY CONTROL SAMPLE

___X___ Acceptable
_____ Acceptable with qualification
_____ Unacceptable
_____ No Laboratory Control Samples Analyzed

Laboratory control sample recoveries are used for a qualitative indication of accuracy (bias) independent of matrix effects. Unless flagged below, one laboratory control sample was analyzed at a rate of one per batch or one per 20 samples. Recoveries were within a range of 70-130%. For analytes which exceeded these control limits, associated detected results are qualified as estimated (J). In cases where the recovery was below 30%, all associated nondetected results are rejected (R) and detected results are qualified as estimated (J).

Comments: None

4. MATRIX SPIKE

___X___ Acceptable
_____ Acceptable with qualification
_____ Unacceptable
_____ No Matrix Spikes Analyzed

Matrix spike recoveries are used for a qualitative indication of accuracy (bias) due to matrix effects. Unless flagged below, one laboratory control sample was analyzed at a rate of one per batch or one per 20 samples. Recoveries were within a range of 70-130%. For analytes which exceeded these control limits, associated detected results are qualified as estimated (J). In cases where the recovery was below 30%, all associated nondetected results are rejected (R) and detected results are qualified as estimated (J).

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

5. BLANKS AND BACKGROUND SAMPLES

__X__ Acceptable
_____ Detection Limits Adjusted

The following blanks were analyzed:
__X__ Method (preparation) Blanks
_____ Field Blanks
__X__ Calibration Blanks
_____ Rinsate Blanks
_____ Background Samples

Preparation (method) blanks were prepared for each batch of samples extracted. A preparation blank was analyzed after every continuing calibration standard, prior to sample analysis unless noted below. Any compound detected in the sample and also detected in any associated blank, must be qualified as non-detect (U) when the sample concentration is less than 5x the blank concentration.

Comments: None

6. DUPLICATE ANALYSES

__X__ Acceptable
_____ Acceptable with qualification
_____ Unacceptable
_____ No Duplicates Analyzed

Type of duplicates analyzed:
_____ Field Duplicates
__X__ Laboratory Duplicates

Calculate the relative Percent Difference (RPD) between the members of duplicate pairs using the equation indicated below. Qualify the detected results as estimated (J) for any analyte whose RPD in a laboratory duplicate exceeds 20% for water samples or 35% for soil samples.

$$RPD = \frac{2(Value\ 1 - Value\ 2)}{Value\ 1 + Value\ 2} \times 100\%$$

Comments: In cases when the compared duplicate concentrations for Lead were within five times the detection limit (1.0 ug/L), RPD values outside the 20% QC limit were considered acceptable.

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

7. INDUCTIVELY COUPLED PLASMA QC

__X__ Acceptable
_____ Acceptable with qualification
_____ Unacceptable
_____ Not required

Interference Check Samples (ICS) - Unless flagged below, an ICS was analyzed at the beginning and end of each run and at least twice every eight hours. Recoveries were within a range of 80-120%. For analytes which exceeded these control limits, associated detected results are qualified as estimated (J) if the concentrations of Al, Ca, Fe, or Mg are higher in the sample than in the ICS.

Serial Dilution Analysis - Unless flagged below, a serial dilution analysis was performed at a rate of one per 20 samples on a sample having analyte concentrations greater than 50 times the IDL. Percent differences were within a range of 0-10%. For analytes which exceeded these control limits, associated detected results are qualified as estimated (J).

Comments: The ICS and ICP serial dilution analyses were not performed for the samples in this report.

8. FURNACE ATOMIC ABSORPTION QC

_____ Acceptable
_____ Acceptable with qualification
_____ Unacceptable
__X__ Not required

Post-digestion spikes - If a furnace AA result was flagged by the laboratory with an E to indicate interference, and the associated post-digestion spike recovery was less than 10%, the associated results are rejected (R).

Method of Standard Additions - If the method of standard additions was required and the correlation coefficient was less than 0.995, the associated results were qualified as estimated (J).

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

9. ANALYTE QUANTITATION

Confirm that analyte quantitation was performed correctly using the following formulas:

Water samples:

$$\text{ug/L} = \frac{\text{(Instrument printout concentration, mg/L)(1000 ug/mg)(final volume of extract, mL)}}{\text{(Initial volume of extract, mL)}}$$

Soil samples:

$$\text{mg/kg} = \frac{\text{(Instrument printout concentration, mg/L)(final volume of extract, mL)(0.001 L/mL)}}{\text{(weight of sample extracted, g)(0.001 kg/g)(fraction solids)}}$$

Comments: Analyte quanitiation is acceptable.

10. OVERALL ASSESSMENT OF DATA

On the basis of this review, the following determination has been made with regard to the overall data usability for the specified level.

__X__ **Acceptable**
_____ **Acceptable with Qualification**
_____ **Rejected**

Accepted data meet the minimum requirements for the following EPA data category:
_____ **ERS Screening**
_____ **Non-definitive with 10 % Conformation by Definitive Methodology**
_____ **Definitive, Comprehensive Statistical Error Determination was performed.**
__X__ **Definitive, Comprehensive Statistical Error Determination was not performed.**

Any qualifications to individual sample analysis results are detailed in the appropriate section above or appear under the comments section below. In cases where several QC criteria are out of specification, it may be appropriate to further qualify the data usability. The data reviewer must use professional judgment and express concerns and comments on the data validity for each specific data package.

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

11. USABILITY OF DATA

A. These data are considered usable for the following the data use objectives stated in the Grey Eagle Mine Site Sampling and Analysis Plan (SAP).

The following data use objectives were indicated in the SAP:
1. To document whether a release to surface water of arsenic, copper, lead, and mercury has occurred and can be attributed to the mine site.

2. To determine whether the site has impacted the Indian Creek habitat for fish.

No data were qualified as rejected, estimated, or nondetected. The data are usable for the purposes indicated above.

B. These data meet quality objectives stated in the SAP.
Data quality objectives are indicated in Section 3.5 and Tables 3-1 and 3-2 of the SAP. The data meet the quality criteria described in the SAP.

12. DOCUMENTATION OF LABORATORY CORRECTIVE ACTION

Problem: None

Resolution: N/A

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

APPENDIX A. ANNOTATED DATA SUMMARY SHEETS

Attached are copies of all data summary sheets, with data qualifiers indicated (hand-annotated), and a copy of the chains of custody for the samples.

When appropriate, the practical quantitation limits have been adjusted to reflect the qualifications noted during the data validation. Errors in the reporting of detected results will not usually be changed by hand. In these cases, the laboratory may be required to re-submit the affected data summary sheets and any associated portions of the data package.

The following data validation qualifiers may be used in this review. Their definitions are taken from the EPA OSWER directive, *Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan and Data Validation Procedures* (EPA/540/G-90/004, OSWER Directive 9360.4-01, dated April 1990).

J The associated numerical value is an estimated quantity because the reported concentrations were less than the required practical quantitation limits or because quality control criteria were not met.

R The sample results are rejected (analyte may or may not be present) due to gross deficiencies in quality control criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

U The material was analyzed for, but not detected. The associated numerical value is the sample practical quantitation limit or adjusted sample practical quantitation limit.

UJ The material was analyzed for, but not detected. The reported practical quantitation limit is estimated because quality control criteria were not met.

NJ Presumptive evidence of the presence of the material (tentatively identified compound) at an estimated quantity.

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

page 1 of 2

CHAIN OF CUSTODY RECORD

K7382

REGION 9
75 Hawthorne Street
San Francisco, California 94105

PROJ. NO.	PROJECT NAME
04026ESTXX	Gray Eagle

SAMPLERS: (Signature)

Columbia Labs 000

	STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Total Metals EPA 200.7 1L Poly	Dissolved Metals EPA 200.7 1L Poly	TOT Hardness EPA 130.2 250mL Poly	DISS Hardness EPA 130.2 250 mL Poly			REMARKS
1		10/13	1130		X	GE-W-1	4	X	X	X	X			* Lab filter for dissolved metals and dissolved hardness.
2		10/13	1245		X	GE-W-1A	4	X	X	X	X			
3		10/13	1200		X	GE-W-2	4	X	X	X	X			
4		10/13	1345		X	GE-W-3	4	X	X	X	X			
5		10/13	1500		X	GE-W-4	4	X	X	X	X			⇨ Lab - please adjust pH for total metals and total hardness samples.
6		10/13	1600		X	GE-W-~~4~~ 5	4	X	X	X	X			
7		10/14	1230		X	GE-W-6	4	X	X	X	X			
8		10/14	1300		X	GE-W-7	4	X	X	X	X			
9		10/14	1430		X	GE-W-8	8	X	X	X	X			← MS/MSD (4 bottles)
10		10/14	1530		X	GE-W-9	4	X	X	X	X			
11		10/14	1615		X	GE-W-10	4	X	X	X	X			
12		10/14	1645		X	GE-W-11	4	X	X	X	X			
13		10/14	1715		X	GE-W-12	4	X	X	X	X			
14		10/14	1500		X	GE-W-14	4	X	X	X	X			
15		10/14	1730		X	GE-W-15	4	X	X	X	X			

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	10/15/99 0900				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature) CAS-K	Date / Time 10/16/99 1000	Remarks Send data to: ecology + environment ~~HQ Golden Storr Dr~~ 350 Sansome St. Ste 300 San Francisco CA 94104 Attn Tina Colon	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

9 29385

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

REGION 9
75 Hawthorne Street
San Francisco, California 94105

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
0402GESTXX	Grey Eagle

SAMPLERS: (Signature)

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TOTAL Metals EPA 200.8 1L Poly	DISolved Metals EPA 200.8 1L Poly	Total Hardness EPA 130.2 250ml	DISolved Hardness EPA 130.2 250ml			REMARKS
16	10/13	1715		X	GE-W-16	4	X	X	X	X			* Lab filter for DISolved metals and DISolved hardness. ⇒ Lab - please adjust for total metals and total hardness samples

Columbia Labs

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	10/15/99 0900				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
			10/16/99 1000	Send Data to: Ecology + Environment 350 Sansome St. Ste. 360 San Francisco CA 94104 c/o Tim Colen	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

9 29384

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-1

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-001

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.27			MS
7439-92-1	Lead	0.04			MS

12/20/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-1

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-001DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.28			MS
7439-92-1	Lead	0.02	U		MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

TOTAL METALS
-1-
INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.
GE-W-1A

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-002

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.1			MS
7440-50-8	Copper	3.80			MS
7439-92-1	Lead	0.06			MS

12/29/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-1A

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-002DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.9			MS
7440-50-8	Copper	2.69			MS
7439-92-1	Lead	0.04			MS

12/29/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-2

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-003

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.38			MS
7439-92-1	Lead	0.06			MS

12/29/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-2

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-003DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.40			MS
7439-92-1	Lead	0.02	U		MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-3

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-004

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.6			MS
7440-50-8	Copper	7.87			MS
7439-92-1	Lead	0.03			MS

12/29/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-3

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-004DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	2.47			MS
7439-92-1	Lead	0.02	U		MS

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Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-4

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-005

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	124			MS
7439-92-1	Lead	0.03			MS

12/20/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-4

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-005DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	105			MS
7439-92-1	Lead	0.02	U		MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-5

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-006

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	12.6			MS
7440-50-8	Copper	0.65			MS
7439-92-1	Lead	0.03			MS

12/25 KK

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-5

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-006DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.7			MS
7440-50-8	Copper	0.33			MS
7439-92-1	Lead	0.02	U		MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-6

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-007

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.5			MS
7440-50-8	Copper	27.6			MS
7439-92-1	Lead	0.06			MS

12/20/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-6

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-007DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	1.7			MS
7440-50-8	Copper	32.0			MS
7439-92-1	Lead	0.06			MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-7

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-008

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	59.1			MS
7440-50-8	Copper	12.1			MS
7439-92-1	Lead	0.11			MS

12/29/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-7

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-008DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	5.4			MS
7440-50-8	Copper	11.0			MS
7439-92-1	Lead	0.04			MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

00024

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-8

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-009

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	4.0			MS
7440-50-8	Copper	10.3			MS
7439-92-1	Lead	0.02			MS

12/20/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

00025

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-8

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-009DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.3			MS
7440-50-8	Copper	10.2			MS
7439-92-1	Lead	0.03			MS

12/29/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

00026

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-9

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-010

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.32			MS
7439-92-1	Lead	0.02	U		MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-9

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-010DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.29			MS
7439-92-1	Lead	0.02			MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-10

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-011

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.29			MS
7439-92-1	Lead	0.02	U		MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-10

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-011DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.28			MS
7439-92-1	Lead	0.02	U		MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-11

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-012

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	4.7			MS
7440-50-8	Copper	0.58			MS
7439-92-1	Lead	0.04			MS

12/29

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-11

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-012DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	4.7			MS
7440-50-8	Copper	0.59			MS
7439-92-1	Lead	0.03			MS

12/29

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-12

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-013

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.31			MS
7439-92-1	Lead	0.02	U		MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-12

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-013DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5			MS
7440-50-8	Copper	0.33			MS
7439-92-1	Lead	0.02	U		MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

00034

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-14

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-014

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	3.9			MS
7440-50-8	Copper	9.73			MS
7439-92-1	Lead	0.02			MS

12/29/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-14

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-014DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	2.0			MS
7440-50-8	Copper	9.70			MS
7439-92-1	Lead	0.03			MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-15

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-015

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.33			MS
7439-92-1	Lead	0.02	U		MS

12/29/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-15

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-015DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5			MS
7440-50-8	Copper	0.34			MS
7439-92-1	Lead	0.02	U		MS

12/22/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

00038

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-16

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-016

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.10	U		MS
7439-92-1	Lead	0.02	U		MS

V 12/29/99

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: TOTAL METALS

Columbia Analytical Services, Inc

TOTAL METALS

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

GE-W-16

Contract: Ecology & Environment, Inc.

Lab Code: KLAB Case No.: 0402 GES SAS No.: SDG NO.: K9907382

Matrix (soil/water): WATER Lab Sample ID: K9907382-016DISS

Level (low/med): LOW Date Received: 10/16/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	0.5	U		MS
7440-50-8	Copper	0.10	U		MS
7439-92-1	Lead	0.02	U		MS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments: DISSOLVED METALS

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	**Location: Siskiyou County, California**
Project TDD Number: 09-9902-0022	**PAN: 0402-GEST-XX**
Laboratory: Brooks Rand Ltd.	**Lab Project Number: EEI004**
Sampling Dates: 10/13/99-10/16/99	**Sample Matrix: Water**
Analytical Method: *MERCURY (1631)*	**Data Reviewer: Julio Paredes/Rich Amano**

REVIEW AND APPROVAL:

Data Reviewer: _____ **Date:** 12/29/99

Technical QA Reviewer: Edward Lorz **Date:** 1/28/00

Project Manager: _____ **Date:** 1/28/00

SAMPLE IDENTIFICATION:

Sample No.	Sample I.D.	Laboratory I.D.
1	GE-W-1 (DISSOLVED)	99BR233-1
2	GE-W-1	99BR233-2
3	GE-W-2 (DISSOLVED)	99BR233-3
4	GE-W-2	99BR233-4
5	GE-W-3 (DISSOLVED)	99BR233-5
6	GE-W-3	99BR233-6
7	GE-W-4 (DISSOLVED)	99BR233-7
8	GE-W-4	99BR233-8
9	GE-W-5 (DISSOLVED)	99BR233-9
10	GE-W-5	99BR233-10
11	Filtration Blank	99BR233-11
12	GE-W-6	99BR236-1
13	GE-W-6 (DISSOLVED)	99BR236-2
14	GE-W-7	99BR236-3
15	GE-W-7 (DISSOLVED)	99BR236-4
16	GE-W-8	99BR236-5
17	GE-W-8 (DISSOLVED)	99BR236-7
18	GE-W-9	99BR236-9
19	GE-W-9 (DISSOLVED)	99BR236-10
20	GE-W-10	99BR236-11
21	GE-W-10 (DISSOLVED)	99BR236-12
22	GE-W-11	99BR236-13
23	GE-W-11 (DISSOLVED)	99BR236-14

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

24	GE-W-12	99BR236-15
25	GE-W-12 (DISSOLVED)	99BR236-16
26	GE-W-14	99BR236-17
27	GE-W-14 (DISSOLVED)	99BR236-18
28	GE-W-15	99BR236-19
29	GE-W-15 (DISSOLVED)	99BR236-20
30	Filtration Blank (DISSOLVED)	99BR236-21

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

DATA PACKAGE COMPLETENESS CHECKLIST:

Checklist Code:

X	Included: no problems
*	Included: problems noted in review
O	Not Included and/or Not Available
NR	Not Required
RS	Provided As Re-submission

Case Narrative:

X	Case Narrative present

Quality Control Summary Package:

X	Data Summary sheets
X	Initial and Continuing Calibration results
NR	CRDL Standard results
X	Preparation Blank and Calibration Blank results
NR	ICP Interference Check Sample results
X	Matrix Spike recoveries
X	Matrix Duplicate results
X	Laboratory Control Sample recoveries
NR	Method of Standard Additions results
NR	ICP Serial Dilution results
NR	Instrument Detection Limits
NR	ICP Interelement Correction Factors
NR	ICP Linear Ranges
X	Preparation Log
X	Analysis Run Log

Raw QC Data Package Section

X	Chain-of-Custody Records
X	Instrument Printouts
X	Sample Preparation Notebook Pages
X	Logbook and Worksheet Pages
NR	Percent Solids Determination

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

DATA VALIDATION SUMMARY

The data were reviewed following procedures and limits specified in the EPA OSWER directive, *Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan and Data Validation Procedures* (EPA/540/G-90/004, OSWER Directive 9360.4-01, dated April 1990).

Indicate with a YES or NO whether each item is acceptable:

1	Holding Times	YES
2	Initial and Continuing Calibrations	YES
3	Laboratory Control Sample	YES
4	Matrix Spike	YES
5	Blanks and Background Samples	YES
6	Duplicate Analyses	YES
7	Inductively Coupled Plasma QC	NR
8	Furnace Atomic Absorption QC	NR
9	Analyte Quantitation	YES
10	Overall Assessment of Data	YES
11	Usability of Data	YES

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

1. HOLDING TIMES

__X__ Acceptable
_____ Acceptable with qualification
_____ Unacceptable

Samples were extracted and analyzed within required holding times except as noted under Comments. In addition, no problems were identified with regard to sample preservation or custody unless specified. For those samples analyzed outside holding time requirements, the detected results have been qualified as estimated (J), and the nondetected results have been qualified either as estimated (UJ) or rejected (R) based on the reviewer's judgement.

All Sample Matrices:
Mercury: 28 days (from collection) for analysis.
Hexavalent chromium: 24 hours (from collection) for analysis.
All other metals: 180 days (from collection) for analysis.

Comments: None

2. INITIAL AND CONTINUING CALIBRATION VERIFICATION

__X__ Acceptable
_____ Acceptable with qualification
_____ Unacceptable

Unless flagged below, an initial calibration verification (ICV) and a calibration blank were analyzed at the beginning of the run, and a continuing calibration verification (CCV) and a calibration blank were analyzed after every ten samples, and at the end of the run. ICV and CCV recoveries were within a range of 80-120% for mercury and tin, and 90-110% for all other metals. For analytes which exceeded these control limits, associated detected results are qualified as estimated (J). In cases where the recovery was below 65% or above 135% (for mercury and tin) or below 75% or above 125% (for all other metals), all associated data are rejected (R).

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

3. LABORATORY CONTROL SAMPLE

__X__ Acceptable
_____ Acceptable with qualification
_____ Unacceptable
_____ No Laboratory Control Samples Analyzed

Laboratory control sample recoveries are used for a qualitative indication of accuracy (bias) independent of matrix effects. Unless flagged below, one laboratory control sample was analyzed at a rate of one per batch or one per 20 samples. Recoveries were within a range of 70-130%. For analytes which exceeded these control limits, associated detected results are qualified as estimated (J). In cases where the recovery was below 30%, all associated nondetected results are rejected (R) and detected results are qualified as estimated (J).

Comments: None

4. MATRIX SPIKE

__X__ Acceptable
_____ Acceptable with qualification
_____ Unacceptable
_____ No Matrix Spikes Analyzed

Matrix spike recoveries are used for a qualitative indication of accuracy (bias) due to matrix effects. Unless flagged below, one laboratory control sample was analyzed at a rate of one per batch or one per 20 samples. Recoveries were within a range of 70-130%. For analytes which exceeded these control limits, associated detected results are qualified as estimated (J). In cases where the recovery was below 30%, all associated nondetected results are rejected (R) and detected results are qualified as estimated (J).

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

5. BLANKS AND BACKGROUND SAMPLES

__X__ Acceptable
_____ Detection Limits Adjusted

The following blanks were analyzed:
__X__ Method (preparation) Blanks
_____ Field Blanks
__X__ Calibration Blanks
_____ Rinsate Blanks
_____ Background Samples

Preparation (method) blanks were prepared for each batch of samples extracted. A preparation blank was analyzed after every continuing calibration standard, prior to sample analysis unless noted below. Any compound detected in the sample and also detected in any associated blank, must be qualified as non-detect (U) when the sample concentration is less than 5x the blank concentration.

Comments: The results reported by the laboratory were corrected for reagent blank contamination.

6. DUPLICATE ANALYSES

__X__ Acceptable
_____ Acceptable with qualification
_____ Unacceptable
_____ No Duplicates Analyzed

Type of duplicates analyzed:
_____ Field Duplicates
__X__ Laboratory Duplicates

Calculate the relative Percent Difference (RPD) between the members of duplicate pairs using the equation indicated below. Qualify the detected results as estimated (J) for any analyte whose RPD in a laboratory duplicate exceeds 20% for water samples or 35% for soil samples.

$$RPD = \frac{2(Value\ 1 - Value\ 2)}{Value\ 1 + Value\ 2} \times 100\%$$

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

7. INDUCTIVELY COUPLED PLASMA QC

_____ Acceptable
_____ Acceptable with qualification
_____ Unacceptable
__X__ Not required

Interference Check Samples (ICS) - Unless flagged below, an ICS was analyzed at the beginning and end of each run and at least twice every eight hours. Recoveries were within a range of 80-120%. For analytes which exceeded these control limits, associated detected results are qualified as estimated (J) if the concentrations of Al, Ca, Fe, or Mg are higher in the sample than in the ICS.

Serial Dilution Analysis - Unless flagged below, a serial dilution analysis was performed at a rate of one per 20 samples on a sample having analyte concentrations greater than 50 times the IDL. Percent differences were within a range of 0-10%. For analytes which exceeded these control limits, associated detected results are qualified as estimated (J).

Comments: None

8. FURNACE ATOMIC ABSORPTION QC

_____ Acceptable
_____ Acceptable with qualification
_____ Unacceptable
__X__ Not required

Post-digestion spikes - If a furnace AA result was flagged by the laboratory with an E to indicate interference, and the associated post-digestion spike recovery was less than 10%, the associated results are rejected (R).

Method of Standard Additions - If the method of standard additions was required and the correlation coefficient was less than 0.995, the associated results were qualified as estimated (J).

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

9. ANALYTE QUANTITATION

Confirm that analyte quantitation was performed correctly using the following formulas:

Water samples:

$$\text{ug/L} = \frac{\text{(Instrument printout concentration, mg/L)(1000 ug/mg)(final volume of extract, mL)}}{\text{(Initial volume of extract, mL)}}$$

Soil samples:

$$\text{mg/kg} = \frac{\text{(Instrument printout concentration, mg/L)(final volume of extract, mL)(0.001 L/mL)}}{\text{(weight of sample extracted, g)(0.001 kg/g)(fraction solids)}}$$

Comments: Analyte quantitation is acceptable.

10. OVERALL ASSESSMENT OF DATA

On the basis of this review, the following determination has been made with regard to the overall data usability for the specified level.

___X___ **Acceptable**
_____ **Acceptable with Qualification**
_____ **Rejected**

Accepted data meet the minimum requirements for the following EPA data category:
_____ **ERS Screening**
_____ **Non-definitive with 10 % Conformation by Definitive Methodology**
_____ **Definitive, Comprehensive Statistical Error Determination was performed.**
___X___ **Definitive, Comprehensive Statistical Error Determination was not performed.**

Any qualifications to individual sample analysis results are detailed in the appropriate section above or appear under the comments section below. In cases where several QC criteria are out of specification, it may be appropriate to further qualify the data usability. The data reviewer must use professional judgment and express concerns and comments on the data validity for each specific data package.

Comments: None

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	**Location: Siskiyou County, California**
Project TDD Number: 09-9902-0022	**PAN: 0402-GEST-XX**

11. USABILITY OF DATA

A. These data are considered usable for the following the data use objectives stated in the Grey Eagle Mine Site Sampling and Analysis Plan (SAP).

The following data use objectives were indicated in the SAP:
1. To document whether a release to surface water of arsenic, copper, lead, and mercury has occurred and can be attributed to the mine site.

2. To determine whether the site has impacted the Indian Creek habitat for fish.

No data were qualified as rejected, estimated, or nondetected. The data are usable for the purposes indicated above.

B. These data meet quality objectives stated in the SAP.
Data quality objectives are indicated in Section 3.5 and Tables 3-1 and 3-2 of the SAP. The data meet the quality criteria described in the SAP.

12. DOCUMENTATION OF LABORATORY CORRECTIVE ACTION

Problem:
The reviewer had difficulty recalculating the sample results (12/22/99) using the equation provided.

Resolution:
The laboratory provided clarification via phone conversation on 12/27/99.

ANALYTICAL DATA REVIEW SUMMARY

Site Name: Grey Eagle Mine	Location: Siskiyou County, California
Project TDD Number: 09-9902-0022	PAN: 0402-GEST-XX

APPENDIX A. ANNOTATED DATA SUMMARY SHEETS

Attached are copies of all data summary sheets, with data qualifiers indicated (hand-annotated), and a copy of the chains of custody for the samples.

When appropriate, the practical quantitation limits have been adjusted to reflect the qualifications noted during the data validation. Errors in the reporting of detected results will not usually be changed by hand. In these cases, the laboratory may be required to re-submit the affected data summary sheets and any associated portions of the data package.

The following data validation qualifiers may be used in this review. Their definitions are taken from the EPA OSWER directive, *Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan and Data Validation Procedures* (EPA/540/G-90/004, OSWER Directive 9360.4-01, dated April 1990).

J The associated numerical value is an estimated quantity because the reported concentrations were less than the required practical quantitation limits or because quality control criteria were not met.

R The sample results are rejected (analyte may or may not be present) due to gross deficiencies in quality control criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

U The material was analyzed for, but not detected. The associated numerical value is the sample practical quantitation limit or adjusted sample practical quantitation limit.

UJ The material was analyzed for, but not detected. The reported practical quantitation limit is estimated because quality control criteria were not met.

NJ Presumptive evidence of the presence of the material (tentatively identified compound) at an estimated quantity.

Brooks Rand Ltd. Chain of Custody Record Page 1 of 1

Client: Ecology & Environment, Inc	e-mail address: tcolen@ene.com	Ship to: **Brooks Rand Ltd.**
Contact: Tim Colen 415/981-2811	PO #:	3950 6th Avenue NW
Address: 350 Sansome St, #300 SF, CA 94104	Sampler's signatures:	Seattle, WA 98107
		206.632.6206
		206.632.6017 fax
Phone #:	Client project ID: 0402-GEST-XX	e-mail: brl@brooksrand.com
Fax #: 415/981-0801	BRL project ID:	www.brooksrand.com

For BRL use only	Cooler temp (°C):	Custody seals present? (Y/N)	Custody seals intact? (Y/N)	Date:	Initials:

	Sample ID	Collection		Miscellaneous				Field Preservation					Analyses required							Comments
		Date 1999	Time	Sampler (initials)	Matrix type = Water	# of containers	Sample field filtered, Y/N	Unpreserved (ice only)	HNO_3	HCl	BrCl	Other (specify)	EPA 1631 B (Hg)							
1	GE-W-6	10/14	1230	TMC	X	2	N	Y					X							
2	GE-W-7	"	1300	TMC	"	2	"	"					X							
3	GE-W-8 ⊛	"	1430	TMC	"	4	"	"					X							⊛ Lab MS/MSD
4	GE-W-9	"	1530	TMC	"	2	"	"					X							
5	GE-W-10	"	1615	TMC	"	2	"	"					X							
6	GE-W-11	"	1645	TMC	"	2	"	"					X							
7	GE-W-12	"	1715	TMC	"	2	"	"					X							
8	GE-W-14	"	1500	TMC	"	2	"	"					X							
9	GE-W-15	↓	1730	TMC	↓	2	↓	↓					X							
10																				

Shipping carrier:				# of coolers:	
Relinquished by:	Date: 10/15/99	Time: 10:00	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received at BRL:	Date: 10/16/99	Time: 09:10

White: LAB COPY Yellow: CUSTOMER COPY

Brooks Rand Ltd. Chain of Custody Record Page 1 of 1

Client: ecology + environment	e-mail address:	Ship to: **Brooks Rand Ltd.**
Contact: Tim Colen	PO #:	3950 6th Avenue NW
Address: 350 Sansome St. #300 San Francisco CA 94104	Sampler's signatures:	Seattle, WA 98107
		206.632.6206
		206.632.6017 fax
Phone #: 415-981-2811	Client project ID: 0402-GEST-XX	e-mail: brl@brooksrand.com
Fax #: 415-981-0801	BRL project ID: EEI004	www.brooksrand.com

For BRL use only	Cooler temp (°C):	Custody seals present? (Y/N)	Custody seals intact? (Y/N)	Date:	Initials:

	Sample ID	Collection		Miscellaneous				Field Preservation					Analyses required							Comments
		Date	Time	Sampler (initials)	Matrix type	# of containers	Sample field filtered, Y/N	Unpreserved (ice only)	HNO_3	HCl	BrCl	Other (specify)	EPA 1631B							
1	GE-W-1	10/13/99	1130	TC/BC	SW	2	N	X					X							Pls fax results to Tim Colen @ 415/981-0801 ASAP
2	GE-W-2	10/13/99	1200	TC/BC	SW	2	N	X					X							
3	GE-W-3	10/13/99	1345	TC/BC	SW	2	N	X					X							
4	GE-W-4	10/13/99	1500	TC/BC	SW	2	N	X					X							
5	GE-W-5	10/13/99	1600	TC/BC	SW	2	N	X					X							
6																				
7																				
8																				
9																				
10																				

Shipping carrier: Fed Ex # 810984386454				# of coolers: 1	
Relinquished by: TM Colen	Date: 10/13/99	Time: 17:15	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received at BRL: L. Wang	Date: 10/15/99	Time: 09:00

White: LAB COPY Yellow: CUSTOMER COPY

78

Dissolved Hg

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
GE-W-1	99BR233 - 1	10/27/99	11/9/99	99-375	0.200	ng/L	U
GE-W-2	99BR233 - 3	10/27/99	11/9/99	99-375	0.260	ng/L	~~B~~ J
GE-W-3	99BR233 - 5	10/27/99	11/9/99	99-375	0.580	ng/L	
GE-W-4	99BR233 - 7	10/27/99	11/9/99	99-375	0.200	ng/L	U
GE-W-5	99BR233 - 9	10/27/99	11/9/99	99-375	0.200	ng/L	U

12/21/99

Filtration

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
GE-W-1	99BR233 - 1	10/15/99		99-351			
GE-W-2	99BR233 - 3	10/15/99		99-351			
GE-W-3	99BR233 - 5	10/15/99		99-351			
GE-W-4	99BR233 - 7	10/15/99		99-351			
GE-W-5	99BR233 - 9	10/15/99		99-351			

DA
12/22/99

Brl Project #: EEI004
Tracking #: 99BR233

Hg

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
GE-W-1	99BR233 - 2	10/27/99	11/9/99	99-375	0.200	ng/L	U
GE-W-2	99BR233 - 4	10/27/99	11/9/99	99-375	0.200	ng/L	U
GE-W-3	99BR233 - 6	10/27/99	11/9/99	99-375	0.980	ng/L	
GE-W-4	99BR233 - 8	10/27/99	11/9/99	99-375	0.200	ng/L	U
GE-W-5	99BR233 - 10	10/27/99	11/9/99	99-375	0.200	ng/L	U
FILTRATION BLANK	99BR233 - 11	10/27/99	11/9/99	99-375	0.410	ng/L	~~B~~ J

EQ

12/23/99

Brooks Rand, Ltd.

Summary of Results

Ecology & Environment, Inc.

Brl Project #: EEI004
Tracking #: 99BR236

Sample/Sampling/Receiving Info

Ecology & Environment, Inc.		BRL	
Sample Identification	**Sampling Date**	**Sample Number**	**Receiving Date**
GE-W-6	10/14/99	99BR236 - 1	10/16/99
GE-W-6	10/14/99	99BR236 - 2	10/16/99
GE-W-7	10/14/99	99BR236 - 3	10/16/99
GE-W-7	10/14/99	99BR236 - 4	10/16/99
GE-W-8	10/14/99	99BR236 - 5	10/16/99
GE-W-8	10/14/99	99BR236 - 7	10/16/99
GE-W-9	10/14/99	99BR236 - 9	10/16/99
GE-W-9	10/14/99	99BR236 - 10	10/16/99
GE-W-10	10/14/99	99BR236 - 11	10/16/99
GE-W-10	10/14/99	99BR236 - 12	10/16/99
GE-W-11	10/14/99	99BR236 - 13	10/16/99
GE-W-11	10/14/99	99BR236 - 14	10/16/99
GE-W-12	10/14/99	99BR236 - 15	10/16/99
GE-W-12	10/14/99	99BR236 - 16	10/16/99
GE-W-14	10/14/99	99BR236 - 17	10/16/99
GE-W-14	10/14/99	99BR236 - 18	10/16/99
GE-W-15	10/14/99	99BR236 - 19	10/16/99
GE-W-15	10/14/99	99BR236 - 20	10/16/99
FILTERATION BLANK	10/16/99	99BR236 - 21	10/16/99

12/20/99

Dissolved Hg

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
GE-W-6	99BR236 - 2	10/27/99	11/9/99	99-375	0.200	ng/L	U
GE-W-7	99BR236 - 4	10/27/99	11/9/99	99-375	0.240	ng/L	~~B~~ J
GE-W-8	99BR236 - 7	10/27/99	11/9/99	99-375	0.580	ng/L	
GE-W-9	99BR236 - 10	10/27/99	11/9/99	99-375	0.360	ng/L	~~B~~ J
GE-W-10	99BR236 - 12	10/25/99	11/5/99	99-376	0.200	ng/L	U
GE-W-11	99BR236 - 14	10/25/99	11/5/99	99-376	0.910	ng/L	
GE-W-12	99BR236 - 16	10/25/99	11/5/99	99-376	0.240	ng/L	~~B~~ J
GE-W-14	99BR236 - 18	10/25/99	11/5/99	99-376	0.200	ng/L	U
GE-W-15	99BR236 - 20	10/25/99	11/5/99	99-376	0.370	ng/L	~~B~~ J
FILTERATION BLANK	99BR236 - 21	10/25/99	11/5/99	99-376	0.320	ng/L	~~B~~ J

12/22/99

Filtration

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
GE-W-6	99BR236 - 2	10/16/99		99-354			
GE-W-7	99BR236 - 4	10/16/99		99-354			
GE-W-8	99BR236 - 7	10/16/99		99-354			
GE-W-9	99BR236 - 10	10/16/99		99-354			
GE-W-10	99BR236 - 12	10/16/99		99-354			
GE-W-11	99BR236 - 14	10/16/99		99-354			
GE-W-12	99BR236 - 16	10/16/99		99-354			
GE-W-14	99BR236 - 18	10/16/99		99-354			
GE-W-15	99BR236 - 20	10/16/99		99-354			
FILTERATION BLANK	99BR236 - 21	10/16/99		99-354			

12/28/99

Hg

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
GE-W-6	99BR236 - 1	10/27/99	11/9/99	99-375	0.680	ng/L	
GE-W-7	99BR236 - 3	10/27/99	11/9/99	99-375	11.900	ng/L	
GE-W-8	99BR236 - 5	10/27/99	11/9/99	99-375	0.200	ng/L	U
GE-W-9	99BR236 - 9	10/27/99	11/9/99	99-375	0.240	ng/L	~~B~~ J
GE-W-10	99BR236 - 11	10/27/99	11/9/99	99-375	0.200	ng/L	U
GE-W-11	99BR236 - 13	10/25/99	11/5/99	99-376	1.110	ng/L	
GE-W-12	99BR236 - 15	10/25/99	11/5/99	99-376	0.460	ng/L	~~B~~ J
GE-W-14	99BR236 - 17	10/25/99	11/5/99	99-376	0.220	ng/L	~~B~~ J
GE-W-15	99BR236 - 19	10/25/99	11/5/99	99-376	0.400	ng/L	~~B~~ J

12/22/99

Received 11/16/99

Columbia Analytical Services INC.
An Employee-Owned Company

November 15, 1999 Service Request No: K9907382

Tim Colen
Ecology & Environment, Inc.
350 Sansome Street, Suite 300
San Francisco, CA 94104

Re: Grey Eagle Mine/0402 GESTXX

Dear Tim:

Enclosed are the results of the sample(s) submitted to our laboratory on October 16, 1999. Final results were transmitted via facsimile on November 11, 1999. For your reference, these analyses have been assigned our service request number K9907382.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 245.

Respectfully submitted,

Columbia Analytical Services, Inc.

Mingta Lin
Project Chemist

ML/td

1317 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 360/ 577-7222 • Fax 360/636-1068

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
J	Estimated concentration. The value is less than the method reporting limit, but greater than the method detection limit.
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Ecology and Environment, Inc.	**Service Request No.:**	K9907382
Project:	Grey Eagle Mine	**Date Received:**	10/16/99
Sample Matrix:	Water		

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Laboratory Control Sample (LCS), and Initial/Continuing Calibration Verification Standards (ICV/CCV).

All EPA recommended holding times have been met for analyses in this sample delivery group.

There were no difficulties experienced during the analysis of this batch.

Approved by Emw **Date** 11/15/99

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX LABORATORY
1337 S. 46TH STREET
BLDG. 201
RICHMOND, CA 94804-4698

NOV - 8 1999

MEMORANDUM

SUBJECT: Case R00S03, SDG 99291B
Results for Sulfate, Sulfide, and Total Dissolved Solids Analysis

FROM: Brenda Bettencourt, Director
EPA Region 9 Laboratory (PMD-2)

TO: Matt Mitguard, Site Assessment Manager
States, Assessment and Planning Section (SFD-5)

Attached are the report narrative and results spreadsheet from analysis of samples from the Grey Eagle Mine Superfund site assessment project. These data have been reviewed in accordance with EPA Region 9 Laboratory policy. Summary information for the data included in this report is as follows:

SITE/PROJECT:	Grey Eagle Mine
CASE:	R00S03
LABORATORY:	U. S. EPA Region 9 Laboratory
SAMPLE DELIVERY GROUP:	99291A
ANALYSIS:	Sulfate (EPA method 300.0)
	Sulfide (EPA method 376.1)
	Total Dissolved Solids (EPA method 160.1)

A full documentation package for these data, including raw data and sample custody documentation, has been prepared and sent to the Quality Assurance Program (PMD-3). Please contact Vance Fong for information regarding third-party review and/or validation of the data.

If you have any questions please contact Rich Bauer at (510) 412-2312, or Ken Hendrix at (510) 412-2321.

ATTACHMENT: Analytical Report

OPTIONAL FORM 99 (7-90)
FAX TRANSMITTAL # of pages ▶ 6

To Tim Colen	From Matt Mitguard
Dept./Agency	Phone #
Fax #	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

USEPA REGION 9 LABORATORY REPORT NARRATIVE

CASE NUMBER:	**R00S03**
SAMPLE DELIVERY GROUP:	**99291B**
PROGRAM:	**SUPERFUND**
DOCUMENT CONTROL #:	**ESTW-9B-2652**
DATE:	**11/03/99**
ANALYSIS:	**SULFATE, SULFIDE AND TOTAL DISSOLVED SOLIDS**

SAMPLE NUMBERS:

SAMPLE ID	LABORATORY SAMPLE ID
GE-W-1	AB25086
GE-W-1A	AB25087
GE-W-2	AB25088
GE-W-3	AB25089
GE-W-4	AB25090
GE-W-5	AB25091
GE-W-6	AB25092
GE-W-7	AB25093
GE-W-8	AB25094
GE-W-9	AB25095
GE-W-10	AB25096
GE-W-11	AB25097
GE-W-12	AB25098
GE-W-14	AB25099
GE-W-15	AB25100
GE-W-16	AB25101

GENERAL COMMENTS

Sixteen water samples were received from the Grey Eagle Mine Superfund project on 10/15/99.

The requested analyses were sulfate (EPA Method 300.0), sulfide (EPA Method 376.1) and total dissolved solids (EPA Method 160.1). All samples were analyzed within the required holding times.

No LFM was analyzed for sulfide due to lack of sample.

SAMPLE RECEIPT AND PRESERVATION

The samples were hand-delivered to the laboratory by the samplers. No shipping or preservation issues were encountered.

QA/QC SUMMARY

No analytes were detected in the blanks associated with this SDG.

Sulfate concentrations in the QC sample were greater than 4 times the added spike. No LFM recovery was calculated.

The RPDs for all duplicates were less than or equal to the 20% QC limit for all analytes where the sample result was greater than or equal to 5 times the quantitation limit. For analytes where the sample result is less than 5 times the quantitation limit the difference between the duplicates was less than the quantitation limit.
All LFB recoveries were within the QC limits.

Questions concerning the data can be answered by Patrick Hirata at (510) 412-2354.

Laboratory Reagent Blanks (LRB)

A laboratory reagent blank is laboratory reagent water or baked sand with all reagents added and carried through the same sample preparation and analytical procedures as the field samples. The laboratory reagent blank is used to determine the level of contamination introduced by the laboratory during analysis.

Laboratory Fortified Matrix and Laboratory Duplicate Analysis

The laboratory fortified matrix spike sample and laboratory duplicate analyses provide information about the effect of the sample matrix on sample preparation and measurement. Poor percent recovery (%R) results and large relative percent difference (RPD) between duplicates may indicate inconsistent laboratory technique, sample nonhomogeneity in soils, or matrix effects which may interfere with analysis.

Laboratory Fortified Blank (LFB) Analysis

The laboratory fortified blank is laboratory reagent water or baked sand with a known concentration of the analytes of interest added by the laboratory with all reagents added and carried through the same sample preparation and analytical procedures as the field samples. Poor percent recovery (%R) results may indicate inconsistent laboratory technique.

EPA REGION 9 LABORATORY-RICHMOND, CA
SUMMARY OF ANALYTICAL RESULTS

Case Number: R00S03
Site: Grey Eagle Mine
SDG: 99291B
Date: 11/03/99

Analysis: Sulfate, Sulfide and TDS
Matrix: Water

Station Location	N/A			N/A			N/A			N/A			N/A			N/A		
Sample I.D.	GE-W-1			GE-W-1A			GE-W-2			GE-W-3			GE-W-4			GE-W-5		
Lab Sample I.D.	AB25086			AB25087			AB25088			AB25089			AB25090			AB25091		
Date of Collection	10/13/99			10/13/99			10/13/99			10/13/99			10/13/99			10/13/99		
Units	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Analyte	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com
Sulfate	3			1900			3			9			86			190		
Sulfide	2			2			1	U		1	U		1	U		1	U	
Total Dissolved Solids	100			2800			100			150			180			360		

Com - Comments refer to the corresponding section in the report narrative for each letter.
N/A - Not Applicable.
N/R - Not Required.
Q - Refer to data qualifiers.
U - The parameter was analyzed for, but was not detected; The associated value is the sample detection limit, adjusted for dilution, if any.
J - The associated value is an estimated quantity.

Station Location	N/A			N/A			N/A			N/A			N/A			N/A		
Sample I.D.	GE-W-6			GE-W-7			GE-W-8			GE-W-9			GE-W-10			GE-W-11		
Lab Sample I.D.	AB25092			AB25093			AB25094			AB25095			AB25096			AB25097		
Date of Collection	10/14/99			10/14/99			10/14/99			10/14/99			10/14/99			10/14/99		
Units	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Analyte	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com
Sulfate	1200			380			400			8			8			12		
Sulfide	2			1			1	U		1	U		1	U		5		
Total Dissolved Solids	1800			660			650			110			230			170		

Com - Comments refer to the corresponding section in the report narrative for each letter.
N/A - Not Applicable.
N/R - Not Required.
Q - Refer to data qualifiers.
U - The parameter was analyzed for, but was not detected; The associated value is the sample detection limit, adjusted for dilution, if any.
J - The associated value is an estimated quantity.

EPA REGION 9 LABORATORY-RICHMOND, CA
SUMMARY OF ANALYTICAL RESULTS

Case Number: R00S03
Site: Grey Eagle Mine
SDG: 99291B
Date: 11/03/99

Analysis: Sulfate, Sulfide and TDS
Matrix: Water

Station Location	N/A			N/A			N/A			N/A			N/A			N/A		
Sample I.D.	GE-W-12			GE-W-14			GE-W-15			GE-W-16			Reagent Blank			Reagent Blank		
Lab Sample I.D.	AB25098			AB25099			AB25100			AB25101			N/A			N/A		
Date of Collection	10/14/99			10/14/99			10/14/99			10/13/99			N/A			N/A		
Units	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Analyte	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com
Sulfate	8			390			8			1 U			1 U			1 U		
Sulfide	1 U			1 U			1 U			1 U			1 U					
Total Dissolved Solids	120			600			110			20 U			20 U					

Com - Comments refer to the corresponding section in the report narrative for each letter.
N/A - Not Applicable.
N/R - Not Required.
Q - Refer to data qualifiers.
U - The parameter was analyzed for, but was not detected; The associated value is the sample detection limit, adjusted for dilution, if any.
J - The associated value is an estimated quantity.

Station Location	N/A
Sample I.D.	Quantitation
Lab Sample I.D.	Limit
Date of Collection	N/A
Units	mg/L
Analyte	Result
Sulfate	1
Sulfide	1
Total Dissolved Solids	20

Com - Comments refer to the corresponding section in the report narrative for each letter.
N/A - Not Applicable.
N/R - Not Required.
Q - Refer to data qualifiers.
U - The parameter was analyzed for, but was not detected; The associated value is the sample detection limit, adjusted for dilution, if any.
J - The associated value is an estimated quantity.

EPA REGION 9 LABORATORY-RICHMOND, CA

SUMMARY OF ANALYTICAL RESULTS

Case Number: R00S03
Site: GREY EAGLE MINE
SDG: 99291A
Date: 11/09/99

Analysis: Metals
Matrix: Sediment

Sample No.	N/A			N/A			N/A			N/A			N/A			N/A		
Sample I.D.	GE-S-1			GE-S-2			GE-S-3			GE-S-4			GE-S-5			GE-S-6		
Lab Sample I.D.	AB25072			AB25073			AB25074			AB25075			AB25076			AB25077		
Date of Collection	10/13/99			10/13/99			10/13/99			10/13/99			10/13/99			10/14/99		
Units	mg/Kg			mg/Kg			mg/Kg			mg/Kg			mg/Kg			mg/Kg		
Analyte	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com
Arsenic	2.2	J	A	2.2	J	A	6.2			5.3			25			32		
Copper	32			46			210			84			63			140		
Lead	2.5	J	B	1.9	J	B	2.7	J	B	4.7	J	B	0.52	J	A	2.8	J	B
Mercury	0.06 U			0.06 U			0.05 U			0.07 U			0.06 U			0.08 U		
% Solids	80			74			70			75			74			59		

Com - Comments refer to the corresponding section in the report narrative for each letter.

Samples reported as mg/Kg dry weight.

N/A - Not Applicable.

N/R - Not Required.

Q - Refer to data qualifiers.

U - The parameter was analyzed for, but was not detected; The associated value is the sample detection limit, adjusted for dilution, if any.

J - The associated value is an estimated quantity.

Sample No.	N/A			N/A			N/A			N/A			N/A			N/A		
Sample I.D.	GE-S-7			GE-S-8			GE-S-9			GE-S-10			GE-S-11			GE-S-12		
Lab Sample I.D.	AB25078			AB25079			AB25080			AB25081			AB25082			AB25083		
Date of Collection	10/14/99			10/14/99			10/14/99			10/14/99			10/14/99			10/14/99		
Units	mg/Kg			mg/Kg			mg/Kg			mg/Kg			mg/Kg			mg/Kg		
Analyte	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com
Arsenic	110			39			2.0	J	A	3.6			2.0	J	A	2.2	J	A
Copper	76			24	J	A	38			56			17			32		
Lead	2.4	J	A	0.83 U			1.6	J	B	2.5	J	B	1.4	J	B	1.7	J	B
Mercury	0.18 U			0.34 U			0.05 U			0.04 U			0.06 U			0.06 U		
% Solids	18			11			77			100			72			73		

Com - Comments refer to the corresponding section in the report narrative for each letter.

Samples reported as mg/Kg dry weight.

N/A - Not Applicable.

N/R - Not Required.

Q - Refer to data qualifiers.

U - The parameter was analyzed for, but was not detected; The associated value is the sample detection limit, adjusted for dilution, if any.

J - The associated value is an estimated quantity.

EPA REGION 9 LABORATORY-RICHMOND, CA
SUMMARY OF ANALYTICAL RESULTS

Case Number: R00S03
Site: GREY EAGLE MINE
SDG: 99291A
Date: 11/09/99

Analysis: Metals
Matrix: Sediment

Sample No.	N/A			N/A			N/A			Quantitation
Sample I.D.	GE-S-14			GE-S-15			Reagent Blank			Limit
Lab Sample I.D.	AB25084			AB25085			N/A			N/A
Date of Collection	*10/14/99*			*10/14/99*			N/A			N/A
Units	mg/Kg			mg/Kg			mg/Kg			mg/Kg
Analyte	**Result**	**Q**	**Com**	**Result**	**Q**	**Com**	**Result**	**Q**	**Com**	**Result**
Arsenic	39			2.1	J	A	0.24 U			2
Copper	75			31			0.28 U			5
Lead	1.4	J	A	1.6	J	B	0.10 U			0.6
Mercury	0.41 U			0.06 U			0.05 U			0.1
% Solids	11			71			N/A			N/A

Com - Comments refer to the corresponding section in the report narrative for each letter.

Samples reported as mg/Kg dry weight.

N/A - Not Applicable.

N/R - Not Required.

Q - Refer to data qualifiers.

U - The parameter was analyzed for, but was not detected; The associated value is the sample detection limit, adjusted for dilution, if any.

J - The associated value is an estimated quantity.

EPA REGION 9 LABORATORY-RICHMOND, CA
SUMMARY OF ANALYTICAL RESULTS

Case Number: R00S03
Site: Grey Eagle Mine
SDG: 99291B
Date: 11/03/99

Analysis: Sulfate, Sulfide and TDS
Matrix: Water

Station Location	N/A			N/A			N/A			N/A			N/A			N/A		
Sample I.D.	GE-W-1			GE-W-1A			GE-W-2			GE-W-3			GE-W-4			GE-W-5		
Lab Sample I.D.	AB25086			AB25087			AB25088			AB25089			AB25090			AB25091		
Date of Collection	10/13/99			10/13/99			10/13/99			10/13/99			10/13/99			10/13/99		
Units	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Analyte	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com
Sulfate	3			1900			3			9			86			190		
Sulfide	2			2			1	U		1	U		1	U		1	U	
Total Dissolved Solids	100			2800			100			150			180			360		

Com - Comments refer to the corresponding section in the report narrative for each letter.

N/A - Not Applicable.

N/R - Not Required.

Q - Refer to data qualifiers.

U - The parameter was analyzed for, but was not detected; The associated value is the sample detection limit, adjusted for dilution, if any.

J - The associated value is an estimated quantity.

Station Location	N/A			N/A			N/A			N/A			N/A			N/A		
Sample I.D.	GE-W-6			GE-W-7			GE-W-8			GE-W-9			GE-W-10			GE-W-11		
Lab Sample I.D.	AB25092			AB25093			AB25094			AB25095			AB25096			AB25097		
Date of Collection	10/14/99			10/14/99			10/14/99			10/14/99			10/14/99			10/14/99		
Units	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Analyte	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com	Result	Q	Com
Sulfate	1200			380			400			8			8			12		
Sulfide	2			1			1	U		1	U		1	U		5		
Total Dissolved Solids	1800			660			650			110			230			170		

Com - Comments refer to the corresponding section in the report narrative for each letter.

N/A - Not Applicable.

N/R - Not Required.

Q - Refer to data qualifiers.

U - The parameter was analyzed for, but was not detected; The associated value is the sample detection limit, adjusted for dilution, if any.

J - The associated value is an estimated quantity.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment, Inc.
Project: Grey Eagle Mine/0402 GESTXX
Sample Matrix: Water

Service Request: K9907382
Date Collected: 10/13,14/99
Date Received: 10/16/99

Hardness, Total

Prep Method: NONE
Analysis Method: 130.2
Test Notes:

Units: mg/L (ppm)
Basis: NA

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
GE-W-1	K9907382-001	10	0.7	1	NA	10/27/99	84	
GE-W-1A	K9907382-002	10	0.7	1	NA	10/27/99	598	
GE-W-2	K9907382-003	10	0.7	1	NA	10/27/99	84	
GE-W-3	K9907382-004	10	0.7	1	NA	10/27/99	116	
GE-W-4	K9907382-005	10	0.7	1	NA	10/27/99	91	
GE-W-5	K9907382-006	10	0.7	1	NA	10/27/99	117	
GE-W-6	K9907382-007	10	0.7	1	NA	10/27/99	600	
GE-W-7	K9907382-008	10	0.7	1	NA	10/27/99	184	
GE-W-8	K9907382-009	10	0.7	1	NA	10/27/99	268	
GE-W-9	K9907382-010	10	0.7	1	NA	10/27/99	90	
GE-W-10	K9907382-011	10	0.7	1	NA	10/27/99	87	
GE-W-11	K9907382-012	10	0.7	1	NA	10/27/99	81	
GE-W-12	K9907382-013	10	0.7	1	NA	10/27/99	80	
GE-W-14	K9907382-014	10	0.7	1	NA	10/27/99	252	
GE-W-15	K9907382-015	10	0.7	1	NA	10/27/99	81	
GE-W-16	K9907382-016	10	0.7	1	NA	10/27/99	ND	
Method Blank	K9907382-MB	10	0.7	1	NA	10/27/99	ND	

Approved By: _____ Date: 11-1-99

B

Ownership History

California Regional Water Quality Control Board
North Coast Region

Cleanup And Abatement Order No. 97-116

Old Gray Eagle Mine
Tailings Disposal Site

for

Gray Eagle Copper Company; and Newmont Mining, Inc.; and
Thomas And Mary Ester Roberts; and Willamette Builders Supply Company; and
Willamette Plywood Corporation; and Josephine Plywood Corporation; and
California Oregon Plywood, Inc.; and Sierra Pacific Industries; and
H.R. Blacketor; and Croman Corporation; and
Siskon Corporation; and William And Maxine Mccoy; and
United States Department Of Agriculture, Forest Service

Siskiyou County

The California Regional Water Quality Control Board, North Coast Region (hereinafter Regional Water Board), finds that:

1. During the years of 1943 through 1945 the Gray Eagle Copper Company, a subsidiary of Newmont Mining, Inc., conducted mining, ore processing, and waste disposal activities associated with workings at the Gray Eagle Mine. The Gray Eagle Mine is located near the headwaters of Luther Gulch Creek which is tributary to Indian Creek which flows into the Klamath River at the town of Happy Camp. Ore processing facilities were set up at the mine site. Tailings from ore processing were disposed at a site adjacent to Indian Creek below the confluence with Luther Gulch Creek. The tailings disposal site is located in Section 15, Township 17 North Range 7 East, Humboldt Meridian, Section 16, Township 17 North, Range 7 East, and Section 22, Township 17 North, Range 7 East, Humboldt Meridian.

2. The copper ore body at the Gray Eagle Mine was a massive sulfide deposit. The mine tailings exhibit above background levels for copper, iron, arsenic and zinc. The tailings are also characterized as low pH and high in sulfates. Water which contacts the tailings leaches metals and other constituents resulting in the direct discharge of contaminants to Indian Creek, a tributary to the Klamath River. Leachate emerges at numerous locations along the toe of the tailings disposal area. The leachate flows in a surface channel which leads directly to Indian Creek. The leachate is discolored and results in precipitates forming and being deposited on rocks in the stream channel and Indian Creek. The discharge has stained the rocks in Indian Creek from the point of waste discharge to the confluence with the Klamath River several miles downstream.

Leachate discharges have occurred since the placement of tailings and continue to occur today.

3. On April 13, 1982 Regional Water Board staff sampled runoff from the tailings disposal area and water from the leachate channel referenced in Finding No. 2. Analytical results confirmed the water to be low pH, high electroconductivity, and contained concentrations of cadmium, copper, lead and zinc which exceeded U.S.E.P.A. ambient water quality criteria for freshwater aquatic life protection.

4. On January 13, 1987 Regional Water Board staff collected samples of the runoff from the tailings disposal area and from the leachate channel referenced in Finding No. 2. Analytical results confirmed that the samples contained concentrations of copper and cadmium which exceed U.S.E.P.A. ambient water quality criteria for freshwater aquatic life protection.

5. On April 17 and 18, 1996 personnel with U.S.E.P.A. and consultants to U.S.E.P.A. conducted a hazardous waste investigation at the tailings disposal area. The results of the investigation are reported in a document prepared by Ecology and Environment, Inc. dated June 17, 1997 and entitled Gray Eagle Mine Site Assessment Happy Camp, California. The investigation included collecting samples of soil, tailings, sediments, stream water, leachate and spring water. Analytical results indicate that the tailings and affected soils and sediments contain elevated levels of arsenic, iron, copper and zinc. The analytical results for leachate channel water indicate elevated levels of copper, iron, nickel, and zinc which exceed U.S.E.P.A. ambient water criteria for freshwater aquatic life protection. Bioassay tests were performed during the investigation. The bioassay test results indicate the leachate in the channel is toxic to rainbow trout but that trout do survive in Indian Creek waters collected above and below the point of waste discharge.

6. The mine tails were deposited on at least three separate parcels of private land and some of the tailings were disposed by private parties on approximately 0.3 acres of adjacent land owned by the United States of America under the administrative jurisdiction of the U.S. Department of Agriculture, Forest Service. The Assessor's parcel numbers for the three private parcels are APN 9-490-050, APN 9-500-010, and APN 9-500-020.

7. Title search documents for the three private parcels referenced in Finding No. 6. above confirm that the history of ownership at the site, beginning in the 1940's when the tailings were deposited, is as follows:

   a. Gray Eagle Copper Company acquired the tailings disposal properties on October 7, 1916. The title search document is an indenture.

b. On August 13, 1945 Gray Eagle Copper Company conveyed the properties to Thomas Roberts, Lawrence J. Roberts, Mrs. Thomas Bigalow, and Mrs. H.E. Bokkin. Title search document is an indenture.

c. On March 1, 1954 Thomas Roberts and Mary Ester Roberts conveyed the properties to Willamette Builders Supply Company, a co-partnership consisting of Harold Leevers and Iris M. Leevers. The title search document is a Grant Deed.

d. On February 11, 1958 Willamette Builders Supply Company merged into Willamette Plywood Corporation. Title search documents are Oregon State Certificates and California Articles of Merger.

e. On July 30, 1962 Willamette Plywood Corporation conveyed the properties to Josephine Plywood Corporation. Title search document is a Warranty Deed.

f. On July 15, 1965 Josephine Plywood Corporation conveyed the properties to California Oregon Plywood, Inc. Title search document is a Warranty Deed.

g. On February 15, 1973 the United States Government forecloses on properties. Title search document is a Federal Judgment and Decree of Foreclosure.

h. On July 10, 1974 the United States Government conveyed the properties to Sierra Pacific Industries. The title search document is a Marshall's Deed on Foreclosure.

i. On December 6, 1974 Sierra Pacific Industries conveyed the properties H.R. Blacketor. Title search document is a Grant Deed.

j. On September 5, 1975 H.R. Blacketor conveyed the properties to Croman Corporation. Title search document is a Grant Deed.

k. On March 16, 1990 Croman Corporation conveyed the properties to Siskon Corporation. Title search document is a Grant Deed.

l. On June 11, 1996 Siskon Corporation conveyed the properties to William and Maxine McCoy. Title search document is a Quit Claim Deed.

All of the above current and former property owners are considered to be responsible parties for cleaning up and abating the effects of mine tailings deposited on the subject properties. The responsible parties above are hereinafter referred to as dischargers.

8. The Water Quality Control Plan (Basin Plan) for the North Coast Region was adopted on December 9, 1993 and amended on March 24, 1994. The Basin plan contains a waste discharge prohibition for the Klamath River Basin which includes the Klamath River and its tributaries. The discharge of mine tailings leachate to Indian Creek is in violation of the Basin Plan.

9. The federal Clean Water Act requires that all point source discharges of pollutants to surface waters of the United States shall apply for and receive a National Pollutant Discharge Elimination System (NPDES) permit. The discharge of mine tailings leachate to Indian Creek has never been issued an NPDES Permit and is, therefore, in violation of the Clean Water Act. The discharger has caused or permitted, causes or permits, or threatens to cause or permit waste to be discharged or deposited where it is, or probably will be, discharged into the waters of the state and creates, or threatens to create, a condition of pollution or nuisance.

10. This enforcement action is being taken for the protection of the environment and to enforce a general standard set forth in the Basin Plan. Therefore, this enforcement action is exempt from the provisions of the California Environmental Quality Act (Public Resources Code, Section 21000 et seq.) in accordance with Section 15321, Chapter 3, Title 14, California Code of Regulations.

THEREFORE, IT IS HEREBY ORDERED that pursuant to California Water Code Sections 13267 and 13304, the dischargers shall cleanup and abate the discharge and threatened discharge and shall conduct the following investigation and cleanup tasks under the direction of a California registered geologist or registered civil engineer experienced in pollution investigation and cleanup:

1. Submit a statement of qualifications by February 1, 1998 of the consulting engineering and geological firm demonstrating experience with mining waste investigations and cleanup.

2. Submit for approval by April 1, 1998, a workplan for investigating the extent of soil and groundwater contamination and the extent of surface water and stream sediment contamination at the site.

3. Submit for approval by September 1, 1998, a feasibility study which outlines corrective action alternatives which are technically feasible to cleanup and abate the discharge from the site.

4. Submit for approval by September 1, 1998, an Extent of Contamination Report which describes:

    a. the vertical and horizontal extent of mine tailings (this needs to include a land survey and map which shows the tails, property

lines, leachate discharge points, and the Indian Creek 100 year floodplain),

b. the vertical and horizontal extent of groundwater contamination,
c. domestic well survey for all wells located within or immediately down gradient of the area of known contamination, and
d. the description of the underlying geologic and hydrogeologic regimes including the direction of groundwater flow.

5. Submit for concurrence by the Executive Officer, by December 1, 1998, a Corrective Action Plan which is to include the following:

   a. discussion of procedures used to evaluate cleanup alternatives including costs figures, technical feasibility, and effectiveness.
   b. detailed description of alternative selected for implementation.
   c. time schedule for implementation of selected alternative.
   d. monitoring proposal to demonstrate the effectiveness of the Corrective Action Plan.

6. Implement Corrective Action Plan within 30 days of concurrence by the Executive Officer.

7. If for any reason the dischargers are unable to perform any activity or submit any documentation in compliance with the work schedule submitted pursuant to this Order and approved by the Executive Officer, the discharger may request, in writing, an extension of time as specified. The extension shall include justification for this delay. An extension may be granted for good cause, in which case this Order will be revised accordingly.

Ordered by: _____
Benjamin D. Kor
Executive Officer

November 17, 1997

(croacao2)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

September 23, 1996

To: David Evans, North Coast Regional Water Quality Control Board
Fr: Karen A. Nelson, Environmental Protection Specialist
RE: Grey Eagle Mine Site Document Review

Introduction

This is a review of the currently available documentation concerning the past owner and operators at the Grey Eagle Mine Site, located in Happy Camp, Siskyou County, California. The land records reviewed discuss property located in "sections 15, 15, 22 and 23". These include documents from the North Coast Regional Water Quality Control Board ("NCRWQCB"), various land records from Siskiyou County, a Project Description prepared by the Siskon Corporation, and certain documents prepared by Dun and Bradstreet.

History of Mining Interests at the Site:

The Grey Eagle Mine, formerly a copper mine, currently operated as a gold mine, is located in the Klamath Mountains in Northern California, near the town of Happy Camp, in Siskiyou County, California, at the confluence of the Indian Creek and the Klamath River. The tailings from the historical mining activity which took place at the mine is located near by, at the confluence of Luther Gulch and Indian Creek, approximately five miles north of Happy Camp. The mine itself is at an elevation of approximately 2,600', while the tailings pile are located at approximately 1,400'.

The first mining claims appear to have been filed in approximately 1895, by W.I. Brown. The five claims filed, referred to as the "Dewey Group", were utilized from 1898-1904, in the form of placer and underground mining activities.

From 1908-1914, additional mining claims were filed by F.H. Dakin. At the same time, in 1910, John and Etta Farish filed a mining claim on the Gray Eagle Mine. In 1916, the Farishs sold the parcels of land which comprises the Gray Eagle Mine area to the Gray Eagle Copper Company.

According to the Siskon Corporation report, an entity called Mason Valley Mines operated the mine from 1914-1919. In the land and patent records reviewed, however, no entity by that name appears.

The mine appears to have been inactive from 1919-1941, while remaining under the ownership of the Gray Eagle Copper Company. In December of 1941, Gray Eagle Copper Company, at this time apparently a subsidiary of the Newmont Mining Company, reopened the mine, and operated the same until 1945.

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To POLLY HAGGIS	From DAVE EVANS
Co.	Co.
Dept.	Phone #
Fax #	Fax #

In July 1945, Gray Eagle Copper Company sold the mining claims and all of the land to Lester and Bertha Flanigan. The Flanigans appear to have owned the land and the mine claims until approximately 1959. On May 24, 1954, the Flanigans entered into a Lease/Option Agreement with the Siskon Corporation. Thereafter, on August 1, 1957, the Flanigans filed a "Notice of Non-Responsibility" relating to work that was being performed by Siskon at the Gray Eagle Mine. On March 19, 1959, the Flanigans filed a quitclaim deed in favor of Siskon for all of the property associated with the Gray Eagle Mine.

Siskon entered in to a mining lease with a Leonard Deay-Reusch on November 15, 1959. This lease was then assigned by DeayReusch to Gray Eagle Corporation on or about February 12, 1960. Siskon thereafter filed a "Notice of Non-Responsibility" on May 6, 1960, relating to work being done by a Leonard Deay-Reusch/Gray Eagle Corporation. To better secure its claim, Siskon filed a "Mining Claimant Notice Request" with the Department of Interior on November 2, 1960.

On July 8, 1965, Siskon entered into an 'Exploration and Option Agreement" with the Bear Creek Mining Company. Bear Creek Mining Company relinquished this option in December 1966.

On May 1, 1967, the Standard Slag Company optioned the Gray Eagle project from Siskon Corporation. Purportedly a lease was executed to this effect on February 22, 1968 (no notation of this lease existed in the land records reviewed). The Siskon Corporation Project Report of 1990 stated that Standard Slag drilled 7,575 feet in 16 holes to determine if the project was worth taking on. Based on the results, Standard Slag decided not to put the mine back into production. Standard Slag retained some ownership interest in the mine and/or the project through 1976, as it executed an Option Agreement with the Noranda Mining Company on October of that year. By 1977, Noranda Mining had drilled ' over 14,000' feet to confirm the presence of a "gold zone".

In 1980, Noranda Mining Company was given a Power of Attorney by Siskon for the filing of an "Application for Timberland Conversion Plan." Such a plan was filed by Noranda Mining Company on December 1, 1980, and was valid until December 31, 1982. Under this plan, Noranda proposed to clear the then existing tailings pond area as part of a dam construction, and proposed to tractor log a pit and storage site area. This construction was done towards the development of an open-pit mine.

By October 1982, Noranda had put the mine back into production as a gold mine. It had an open pit mine, a mill, and a tailings mill located at the site, in addition to numerous other support structures and equipment. It used a "carbon-in-pulp" process, which including grinding of the mined ore, cyanide leaching, carbon adsorption, and electrowinning and bullion smelting components. The tailings generated by the mining activities were sent through a pipeline to another area for disposal. Water was recycled back to the mill for use as process make-up water. Excess water in the tailings impoundment was supposedly withdrawn, treated, and discharges to a land application site located at the bottom of the Luther Gulch drainage in the Indian Creek floodplain. The mining operations ceased in 1987, by which time over 180,000 ounces of gold had been produced from over 1 million tons of material. Noranda Grey Eagle thereafter terminated its lease in June of 1987.

In January 1988, Siskon was purchased by Centurion Gold, Inc., which included the Grey Eagle Mine. In April 1989, Siskon, according to their Project Report, decided to reevaluate whether the mine was suitable

for further copper production. This led to a feasibility study, which included fairly detailed plans concerning the establishment of a waste dump and tailings ponds. Part of the proposal regarding the tailings ponds would involve the construction of a tailings pond on the site where the old Newmont Mine Company tailings were. To accomplish this, Siskon proposed moving the Newmont tailings and relocating them to a new, lined facility. It is not clear from the documents whether this plan was ever put into effect.

History of Timber Interests at the Site:

A review of the local land records and documents obtained from the NCRWQCB indicates that during various times, timber and wood milling (collectively the "timber interests") operations took place at the mine. The land is described as being in section 15 and section 22, Township 17, Range 7 East, Humboldt Meridian, of the Siskiyou County land records. The timber and ownership interests and/or business activities appear to been most active in the area during the periods when the mine was inactive, from approximately 1950 to the mid 1970s.

The land at issue appears to have been claimed initially by a Fred Pine on May 4, 1909, under the Homestead Act. Mr. Pine sold the property to Willard Wright on August 15, 1915. Approximately one year later, on October 7, 1916, Mr. Wright sold the property to the Gray Eagle Copper Company.

Gray Eagle Copper Company sold the property on August 13, 1945 to Tom and Mary Roberts. On March 2, 1954, Tom and Ester Roberts sold the property to Willamette Builders ("Willamette") and Harold and Iris Leevers (a partnership out of Oregon). On July 19, 1954, Willamette leased all of the property to the Douglas-Guardian Warehouse Corporation on a year-to-year basis.

By deed dated July 31, 1956, Willamette purportedly gave "all property located in Siskiyou County" to Harold Leevers. On January 27, 1958, the Willamette Plywood Corporation ("WPC") merged with the Columbia Steamship Company, with Willamette Plywood being the surviving corporation. There are no records to indicate any corporate relationship between Willamette and WPC, however, WPC granted a utility right of way over the subject property to the California Oregon Power Company on March 26, 1959, which would appear to indicate some corporate relationship between the two, or at least with Harold Leever. Thereafter, WPC gave numerous mortgages to the National Bank of Portland. On August 2, 1962, WPC sold all of its interest in the land in Happy Camp, Siskiyou County, California, to the Josephine Plywood Company ("Josephine"), another Oregon company.

Josephine, over the succeeding two years, proceeded to give numerous mortgages in favor of the National Bank of Portland and the Small Business Administration, using the Happy Camp land and equipment as collateral. Josephine also continued leasing the property, or some portion thereof, to the Douglas-Guardian Warehouse Corporation. On July 9, 1965, Josephine filed a "Transferee's Notice to Creditors" of its intent to sell the Happy Camp property and all equipment and materials there to California Oregon Plywood, Inc. ("COP"). This sale was finalized by Warranty Deed and Bill of Sale on July 30, 1965.

On July 21, 1965, COP gave a mortgage to the U.S. National Bank of Oregon, again using the Happy Camp property and equipment as collateral. On April 30, 1968, the United States, on behalf of the Small Business Administration, filed a foreclosure notice against COP relating to all of the property at Happy

Camp. This ultimately led to a Decree of Foreclosure (February 1, 1973) and a Marshal's Sale (December 6, 1974). The property was purchased at Sierra Pacific Industries for $30,000 (a deed of foreclosure was filed on July 10, 1974).

A grant deed exists that indicates that Sierra Pacific sold the property to H.R. Blacketor on or about December 6, 1974, but retained certain logging rights. Thereafter, H.R. Blacketor sold the property to Croman Corporation on or about October 2, 1975, with Blacketor reserving some timber harvesting rights. On December 26, 1976, a Certificate of Merger was filed evidencing SWF Plywood Co., merging into Southwest Forest Industries, Inc. ("Southwest"), with Southwest assuming all assets and liabilities of SWF Plywood. Southwest changed its corporate name to Stone Container Corporation on May 20, 1987.

Croman Corporation sold an Option to Purchase to Siskon Corporation on December 11, 1989. Under this option, Siskon was to evaluate the feasibility of reopening the Grey Eagle Mine, while allowing Croman to retain certain logging rights for five years.

cc: Bill Lewis, Emergency Response Office
David Rabbino, Office of Regional Council

File

NEWMONT MINING CORPORATION
300 PARK AVENUE
NEW YORK, N. Y. 10022

October 24, 1967

Mr. John R. Harmon
Manager, Western Division
The Standard Slag Company
Post Office Box 4400
Reno, Nevada

Dear Mr. Harmon:

This will acknowledge your letter of October 10 requesting information concerning this company's operation at the Gray Eagle copper property near Happy Camp, California. We received a similar request a few months ago from Mr. H. B. Chessher of Siskon Corporation which we considered was made in behalf of your company. At that time, we sent Mr. Chessher maps and other information on the mine prior to the termination of our operation there.

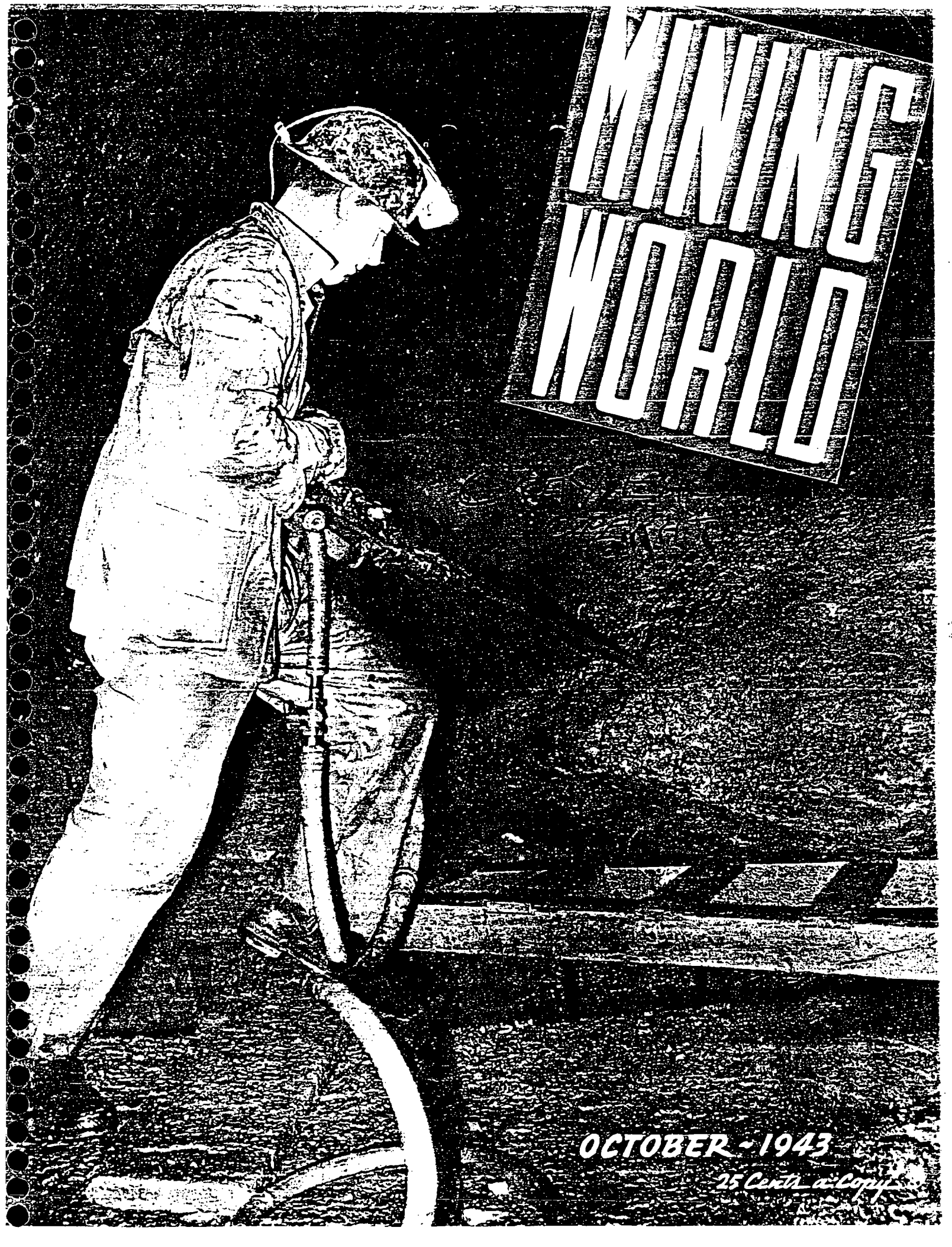
In answer to your question about any serious problems encountered, there was of course a chronic labor shortage which affected production costs materially. The operation was based on mining a small, relatively high grade and high cost deposit at a guaranteed price for copper, and the mine was shut down when the contract was filled because the grade of the remaining tonnage didn't pay to mine at the market prices.

Very truly yours,

R. B. Fulton
Vice President

RBF:fd

cc: Mr. H. B. Chessher ✓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Vol. 5 October, 1943 No. 10

Sample Locations

Subject	Page
California's Gray Eagle Copper Company	5
Spiral Gravity Concentration—Humphreys Gold Corporation Beneficiates Oregon Chromite Sands with New Process	10
The Need for Intelligent Speculation	14
The Story of Pinchi Lake—British Columbia	16
New Idria-Alaska Quicksilver Mining Co.—Alaska	18
Dredging Industrial Sapphires—Montana	19
Montana Mineral Industry After the War	22
Bunker Hill Modernizes Its West Mill	23
Canadian Government Closes Rich Emerald Tungsten Mine as War Requirements Met	25
Canadian Institute of Mining and Metallurgy to Hold Annual Convention	28
Campaign Organized to Recruit Labor for Utah Mines	31
Utah Concern Drilling for Carnallite	33
British Columbia Still Plans Iron and Steel Industry	35
British Columbia Manpower Shortage Causes Mining Curtailment	37
Utah and Colorado Benefit by USBM Exploration Program	38

The Cover Picture

Block-holing a boulder on the grizzly in an Alaska-Juneau bulldoze chamber. This scene is commonplace at Alaska-Juneau, being a result of the powder drift system of mining which breaks a substantial portion of the ore in very large pieces. The drill shown in the picture is of Gardner-Denver manufacture.

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The Message of Kiska —

By Charles Lugrin Shaw

THE bloodless victory at Kiska was more than a heartening milestone in war on the Pacific.

The event goes down in history as the first time that American and Canadian troops combined in offensive action in the western hemisphere. It was the first time since 1812 that a military force left Canada direct for a battlefield, and in 1812 the Canadians were at arms against the United States.

The contrast between the two events—the events of 1812 and 1943—expresses the tremendous changes that have come to pass during the past century in the relationship of the two great nations of this continent.

And yet what happened at Kiska was merely a culmination of dramatic developments that have in the past two years brought the two nations closer than ever before. The stirring series of events began before Pearl Harbor—back in the anxious days when Tokyo first wooed the Axis and Canada's answer was to build air bases to Alaska, even before Canada and Japan were at war. Then followed the Alaska military highway, the pipeline from the oil field of Norman and other vast construction projects aimed at the single objective of making Pacific North America invulnerable to attack, of eliminating the threat of invasion.

In the heat and fury of war the United States and Canada have been welded together in a common purpose. Newly established bases, the highway and the pipeline will all play their part in making victory sure.

And when the war is won, is it too much to expect that the same elements which forged unity in war and thus gained military success will achieve a continuing cooperation in the advancement of this region in the coming years of peace?

But when peace returns, let us not forget the real significance of Kiska's message, which is simply this: That Canada and the United States are secure and able to pursue their course in their own way only when the approaches to this continent are adequately protected. In tomorrow's inevitable age of economic expansion in the North Pacific let us always remember the necessity of a strong and permanent program of defense.

"The Unknown Country"—

UNDERSTANDING of Canada and the Canadians will be advanced by a volume "The Unknown Country—Canada and Her People," written by Bruce Hutchison, whose home is at Saanich, on Vancouver Island.

This man Hutchison is a writer of ability. Some of his work in this book will stand on its merits among the finest things in English.

Here is history in an hour; travel in a day's stroll; food for thought in a nutshell.

Hutchison looks lovingly upon his Canada, but in his devotion does not lose the objective, realistic view of the reporter. He is loyally national while he is intelligently international.

This young Canadian will draw you a singularly clear picture of the relationship between Canada and the United States. He will show you the economic kinship of North Americans, so plainly that you will scarce escape the conviction that national boundaries need not be barriers to the comings-and-goings of neighbors, and to the ebb-and-flow of their commerce.

Nations may be interdependent without sacrifice of their independence.

A continent can live at peace where there is comprehending.

"The Unknown Country" reiterates the doctrine which the Miller Freeman Publications have espoused:

There is a community of interest in Pacific North America which transcends national boundaries without impairing them.

Mr. Hutchison's thesis in "The Unknown Country" parallels the view of the Miller Freeman Publications very closely—

Perhaps that is why we think he is so right, and his book so well worth reading.

California's

Gray Eagle Copper Co.

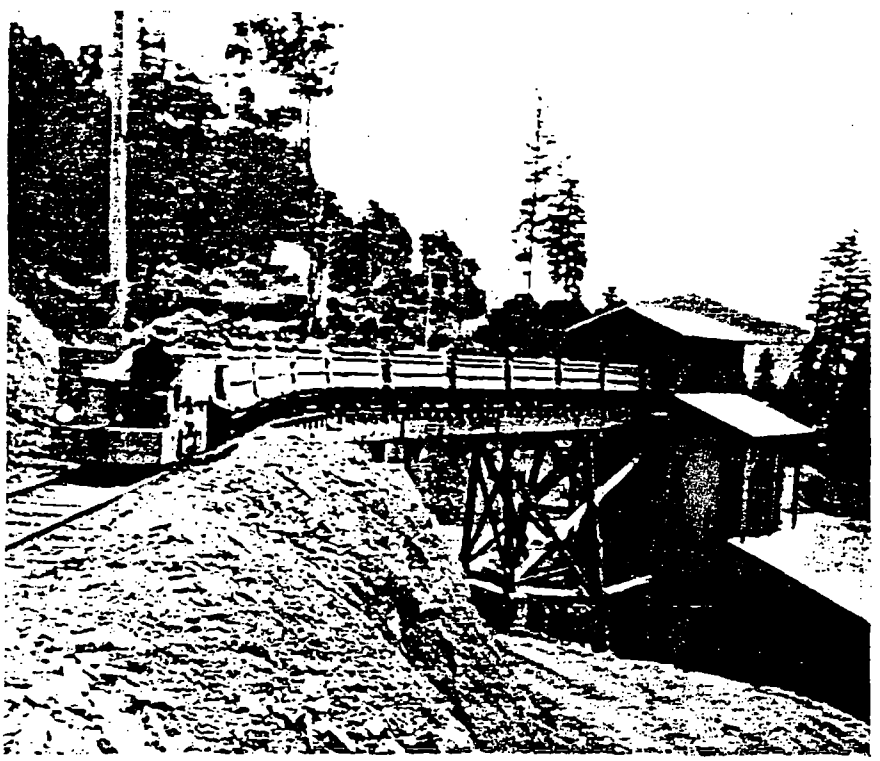
Newmont subsidiary builds new mill on limited orebody to become largest producer of copper in the state.

Surface installations at the Gray Eagle mine, located near Happy Camp in Siskiyou county, California. Built under wartime conditions the mill was designed to keep critical material requirements at a minimum.

LARGEST copper producer in California at the present time is the Gray Eagle mine, located off the Klamath river in Siskiyou county a few miles from Happy Camp. The property is owned and operated by the Gray Eagle Copper Co., a subsidiary of the Newmont Mining Corp., well known for its productive gold mining enterprises in the Mother Lode area around Grass Valley and Nevada City.

Reopened in 1942 after lying idle for 24 years, the property consists of 32 claims which have been extensively developed by a series of tunnels and underground workings. A modern concentrator of 700-ton capacity went into operation in the spring of this year, and since that time a 3.4-mile aerial tramway has been completed over the rough mountain country between the mill and Thompson Creek, eliminating 21 miles of the truck haul previously necessary to deliver the concentrates to the railroad at Yreka.

Managing the project for the Newmont company is R. J. Hendricks, formerly in charge of the Nevada City unit which includes the Murchie, Ziebright and Browns Valley properties. Assisting Mr. Hendricks is W. P. Goss, until recently stationed at a Newmont holding in South Africa. Duncan King is mill superintendent.



Train of 85 cu. ft. Granby-type cars discharge to coarse ore bin above the crushing plant. Note the laminated wood construction of the bin.

In June a total of 170 men were employed, about 20 less than the number needed for full-scale operations. Living accommodations for considerable of this number are available at the mine, where an unusually modern "hotel" for single men has been erected together with a number of comfortable family dwellings for the staff. Situated in one of the most remote and beautiful regions of California, Happy Camp recently had its housing facilities augmented by a Federal housing project involving the construction of 60 modern family homes. Most of these are now available to the married employes.

Newmont's copper project near Happy Camp is frequently confused with the Grey Eagle mine in Glenn county. The latter is a chrome property under development by the Rustless Mining Corp., and is located about 200 miles from Happy Camp in the vicinity of Orland.

The Gray Eagle copper property is not a new mine, having first been located in 1895 by W. I. Brown. The original five claims, referred to in

C. E. Robinson operating a 20-hp. Ingersoll-Rand tugger hoist in radial slicing operation. This method is employed from the top of centrally located raises driven from the upper level to remove 60' sections of ore near the surface.

Below—

Granby-type cars of 85 cu. ft. capacity receiving ore from chute on the main haulage level. The loading gates are air operated.

early reports as the Dewey group, were later bonded to Frank H. Dakins, Jr., of Yreka. Early development included 100' of tunnel and 280' of drift, all in ore. Following the campaign of development work by Dakins, Gray Eagle, during a period of two or three years ending in 1918, performed approximately 10,000' of underground work in addition to a large amount of diamond drilling, mostly from the surface.

Early Development —

From 1918 until early in 1942 the property laid idle and no work was done except for necessary annual assessment work. Indeed, none of the prospects other than those containing gold in Siskiyou county received any attention, though the region is generally recognized as one of the most mineralized areas in the state.

This condition obtained for two reasons: depressed metal prices after the last war, and the remoteness of the region from highway and railroad communications. Happy Camp is 76 miles from the railroad and most of the copper, chrome and base metal prospects are still farther away. With the exception of state-highway 96, which follows the Klamath almost to the ocean, it can be said that the county is virtually without roads. At one time there was talk of building a railroad from the vicinity of Hornbrook down the Klamath river, but the plan never materialized. Until the present urgent demand for metals brought action on a few access roads, Siskiyou county mineral development was at a standstill.

The history of the present work at Gray Eagle dates back to 1941 when the government first began its active search for additional supplies for copper. At the request of the Metals Reserve Co., Newmont promptly launched a development program at the property and laid plans for erection of a mill. A small amount of pre-development work was conducted late in 1941, the main work getting underway the following January. Mill construction began in May, but was seriously handicapped by a shortage of construction labor and slow delivery of equipment and supplies. When the mill began operating in March of this year a total of 500,000 tons of milling ore had been blocked out, an amount approximately equal to the total reserves of the mine. All work undertaken at the property has been entirely financed by the company.

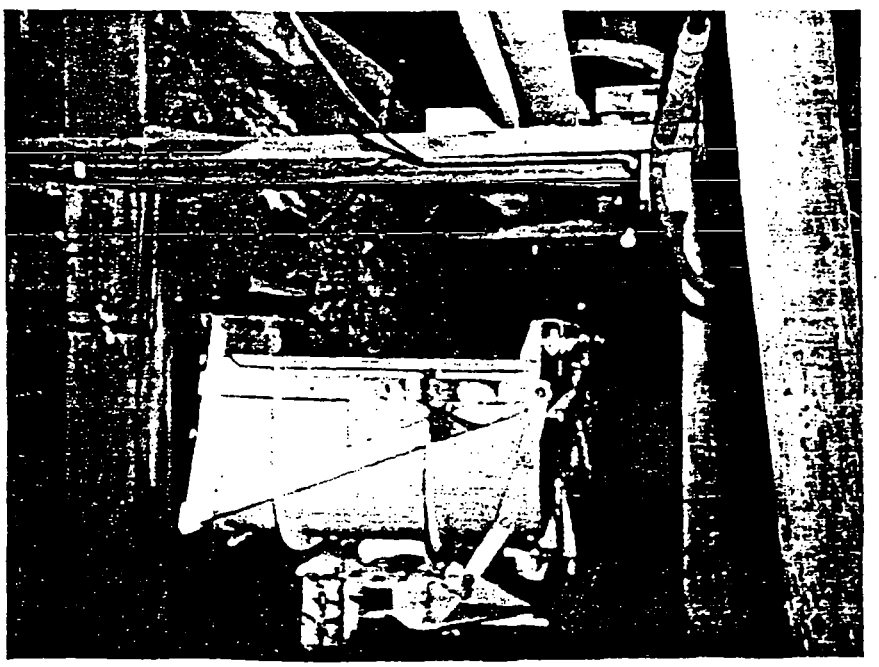
Geology —

The mineralized zone consists of a flat bedded deposit in a sedimentary schist, trending roughly southeast with a dip 25 degrees northeast. The commercial portion of the mineralized bed consists of a pyritic chalcopyrite section averaging about 12' in thickness and contained within the so-called iron formation which ranges from 100 to 150' in thickness. The economic limit for mining has been established at 4.'

East and west faults with throws ranging from a few inches to several feet intersect the vein at frequent intervals, complicating clean extraction to a moderate degree. So far, only two large faults have been encountered, these showing a dislocation of over 60'. The northern limit of the orebody is established by a large north dipping fault. The down throw section north of this fault was located during the previous period of operations and sufficiently developed by winzes as to demonstrate its uncommercial grade.

In the spring of 1942 the company enlarged the main adit, extended it 600' to a total of 1000', and drove raises up to the proposed levels. These were later connected to a 3-compartment shaft raised 240' from a point 500' in from the main portal. The shaft is equipped with a single deck cage, waste chute and service compartment.

Mining is conducted from four



levels driven east and west under the orebody from levels out from the shaft. Normal practice is to drive raises at 60' intervals up into the orebody from the drift level, the broken ore being removed from flat stopes by scrapers. Sections up to 15' in width are stoped from foot to hanging wall. In wider areas the ore is taken in two slices. Ore delivered to the drift level is transferred by 50-hp. tugger-hoists to an ore pass connecting with the main haulage level.

The No. 1 level, 210' above the adit, has been driven through to the south side of the hill where 60' sections of ore are being removed by a system of radial slicing employing hoist and scraper setups at the top of centrally located raises. Generally speaking, operations are retreating from the south end of the orebody toward the north, the mined out areas being permitted to cave.

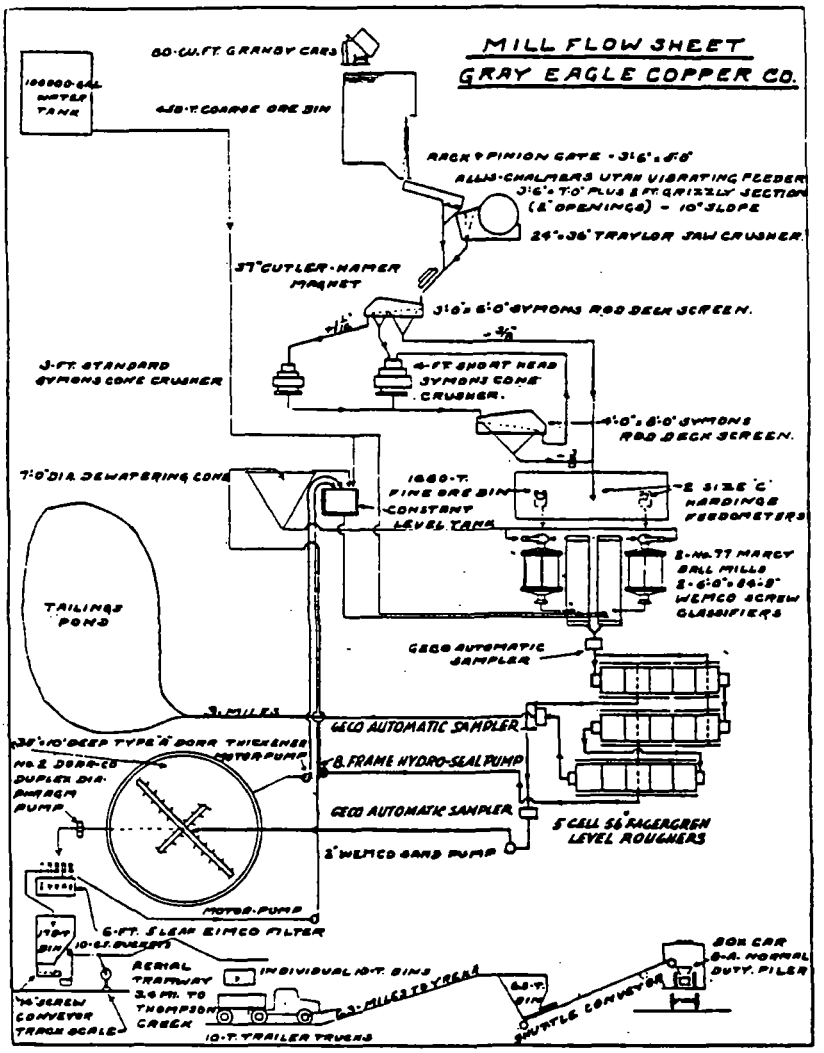
Drilling is relatively easy, only moderate problems being presented when massive sulphide material is encountered. Round 1-1/8" steel is used on drifters and jackhammers, and 1" quarter octagon on stopers. Starter bits are 1-7/8" followed by 1/8 reductions.

On the main haulage level ore is loaded from chutes into Granby-type cars of 85 cu. ft. capacity. The loading chute gates are air operated. The choke gate, which serves to control the flow of large material, is equipped with a 5" air cylinder, that on the main loading gate being 8". A train consists of twelve cars pulled by a 6-ton storage battery locomotive. Batteries are charged at a 3-rack charging station located off the main haulage level.

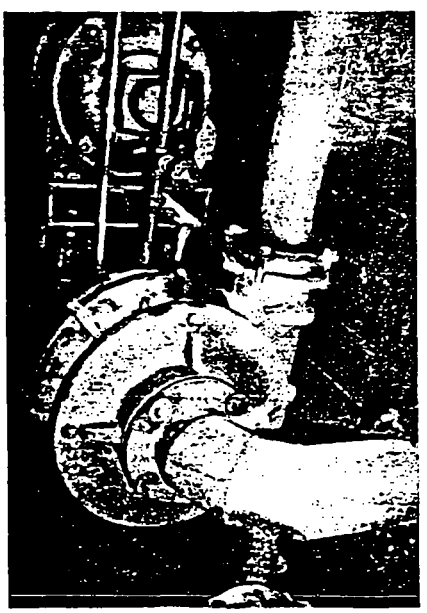
The mine enjoys good natural ventilation throughout. Workings are quite dry, the mine making only 15 gpm. of water.

Compressed air is supplied at 105 lb. pressure by a new 27 x 16 x 18" Ingersoll - Rand PRE-2 compressor driven by a 350-hp. GE synchronous motor. A Chicago-Pneumatic Simplate Valve unit of 1000 cfm. capacity is available as a standby.

Detachable bits are sharpened at the mine. The bits are first gauged and segregated according to size, after which they are reheated to 1450°, and then quenched in a bubble bath. Final tempering involves a 30 minute treatment in an oil bath under a temperature of about 350°. Usually it is necessary to operate the bit department only two days a week, the work being performed by men normally engaged in the other shop.



The various structures comprising the Gray Eagle surface plant were built with a minimum of critical materials. The main mill building is of timber frame construction sheeted with roofing paper. Wood construction was utilized in the various ore bins, thickener tanks, etc. While not presenting a particularly attractive appearance, the installations are, nevertheless, both suitable and appropriate for the work they have been designed to do—producing copper for war industry.

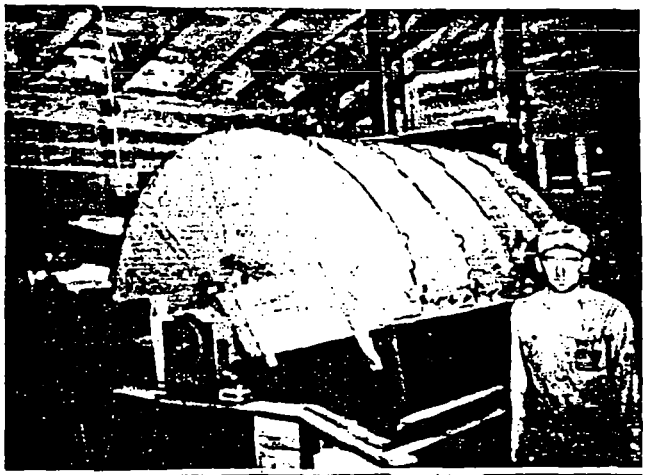


B-Frame Hydroseal pump used to deliver middlings from the rougher circuit to a dewatering cone. Spigot product from the cone is returned to the ball mills for regrinding.

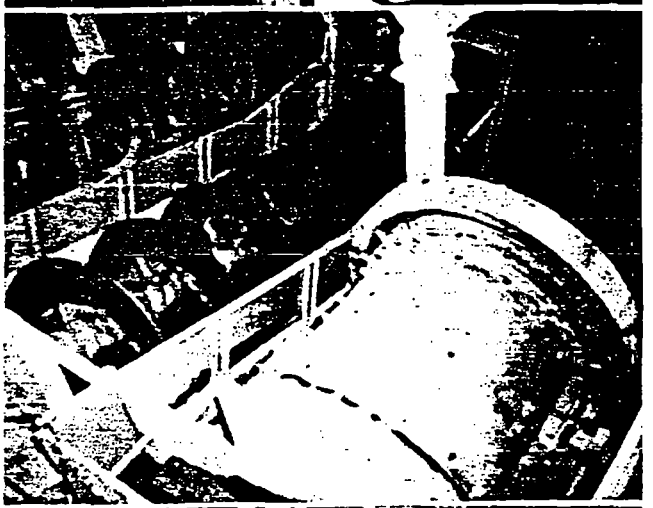
Milling —

Mill Superintendent King states that while the ore is quite high in iron the metallurgical problems are not particularly complex. The copper mineral is principally chalcopyrite, with small amounts of chalcocite and covellite. Some of the ore reaching the mill is of a slightly altered composition, but this has been mixed with the regular feed and has created no particular problems. Quite fine grinding is necessary, however, due to the close association of the copper mineral with the iron.

Ore from the mine is dumped into a coarse ore bin of laminated wood construction having a live capacity of 400 tons. The material is discharged through rack and pinion gate onto an Allis-Chalmers Utah-type vibrating feeder, the final 2' of which consists of a section of 2" interspaced grizzly. A 24x36" Traylor jaw crusher comprises the primary crushing unit, making a reduction to minus 4". Joining on No. 1 conveyor, the crush-

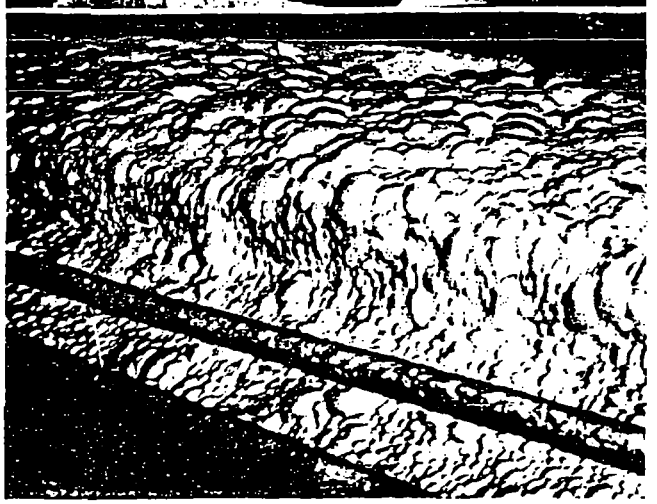


Underflow of the concentrate thickener is delivered at 60 percent solids to this 6' Eimco 5-leaf filter. Joe Steiert is the operator.



Grinding circuit is arranged with one right and one left hand unit. Equipment includes two Marcy 77 ball mills working with 72" Wemco screw classifiers.

Ed Berger, mill foreman, and five 56" Fagergren flotation machines comprising a part of the rougher circuit. Concentrates are taken from the first three cells without further cleaning.



Froth from one of the rougher cells in the Gray Eagle flotation circuit. Ratio of concentration is about six to one.

er product and grizzly undersize pass under a 37" Cutler-Hammer mushroom-type magnet syspended over the head pulley for removal of tramp iron. At this point the feed is transferred to No. 2 conveyor connecting with the primary screen. The latter is a 3x6' Symons Rod Deck unit comprised of three sections. The first two sections are fitted with rods giving a 3/8" opening, the third section passing minus 1-9/16" material. The minus 3/8" material bypasses the secondary screen and goes direct to the fine ore bin. The plus 3/8" minus 1 9/16" product is delivered to a 4' Symons short head crusher and the oversize from the last screen goes to a 3' Symons standard cone. The latter unit is direct connected to a 60-hp. motor through a Falk coupling. Power to the larger crusher is through direct drive by a 125-hp. motor. The product of both crushers is conveyed to a 4 x 8' Rod Deck screen with 3/8" interspaces in all sections. Oversize returns to the 4' short head crusher, the minus 3/8" material joining on No. 6 conveyor to the fine ore bin.

The fine ore bin has a capacity of 1750 tons and is served by belt conveyor through a hand-operated tripper. All conveying equipment is of Robins manufacture.

The grinding circuit is arranged with one right and one left hand unit. Equipment includes two Marcy No. 77 ball mills served by Hardinge "Constant-Weight" feeders, each mill in closed circuit with a Wemco 72" screw classifier. The mills carry a 35 percent charge of 2" balls and are operated at 22.9 rpm. by direct connected 200-hp. motors. Ball consumption averages about 1.5 lb. per ton of ore ground. Classifier overflow is at 25 percent solids running 10 percent plus 200-mesh—the fine grind being dictated by the close association of the copper with the iron. Minerec "B" and quicklime are added to the grinding circuit, and quantities of Z-3 and Z-5 are introduced to the classifier overflow. Frother consists of equal volumes of Dupont B-23 and GNS No. 5 Pine Oil. Overflow from the two classifiers joins and passes a flotation feed sampler before entering the head box of the first bank of roughers. The flotation circuit consists of three banks of roughers in series, each bank comprising five 56", level type Fagergren flotation cells. Concentrates from the first three cells, without benefit of further cleaning, flow to the clean concentrate sump from where they are pumped by a 6" Wemco pump to a 35' Dorr thickener. Thickener underflow is pumped at about 60 percent solids by a 2" Dorr duplex diaphragm pump to a 6' Eimco 5-leaf filter.

Froth from the next four cells is returned to the head-box of the first bank of roughers. That from the remaining eight roughers flows to a

middling sump from which it is pumped by a "B" Frame Hydroseal to a 7' Callow dewatering cone. The spigot product from the cone is returned to the mill circuit for regrinding.

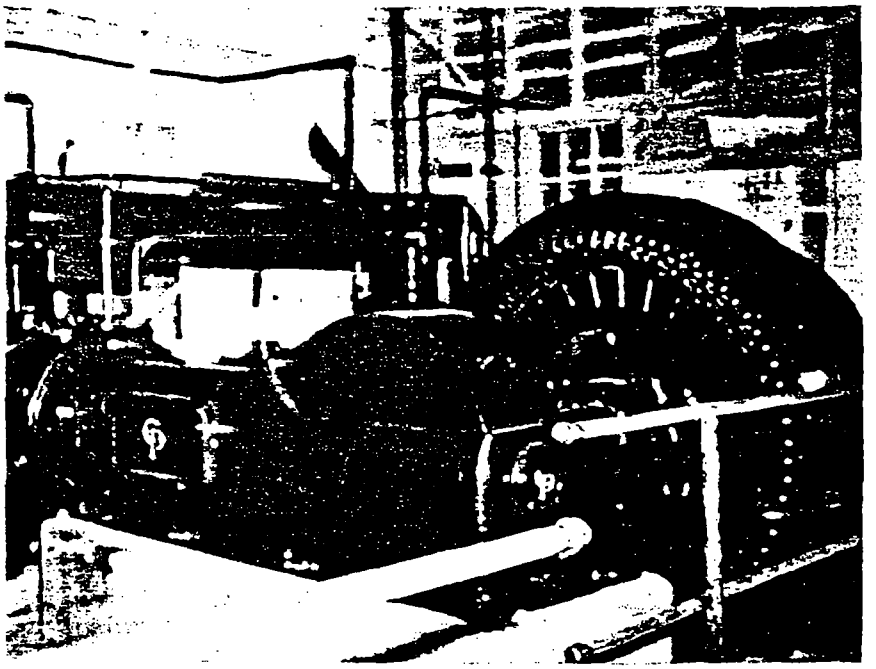
The filter cake is discharged to an 18" conveyor belt which delivers it to the 100-ton storage bin at the tram. From the storage bin the concentrates, averaging 20 percent copper, are fed by a 14" screw conveyor into 10 cu. ft. buckets. The buckets are first weighed and then dispatched to the terminal at Thompson Creek.

The tailings launder is approximately three miles in length, a disposal pond having been established on Indian Creek flat five miles above Happy Camp and north of highway 96.

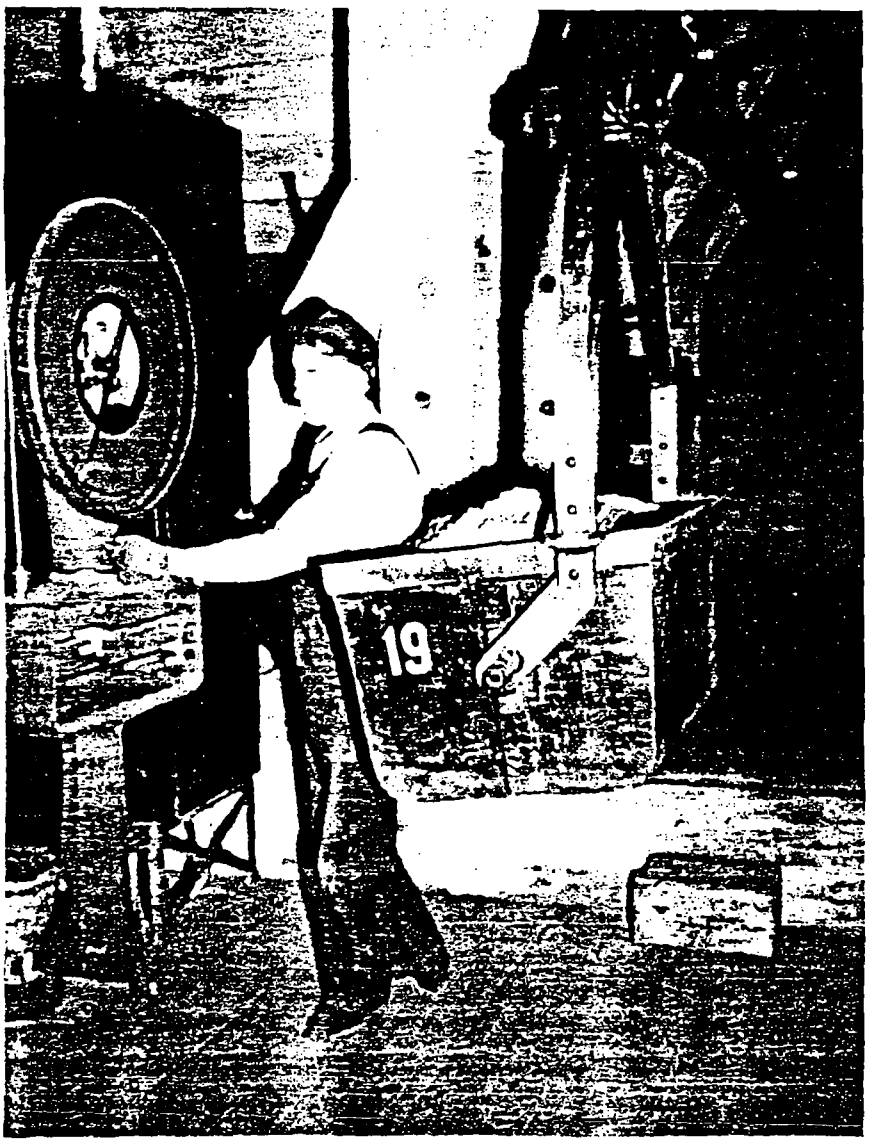
Aerial Tramway —

The aerial tramway connecting the mill with Thompson Creek is 3.4 miles in length and was constructed for the purpose of avoiding 21 miles of trucking over a tortuous mountain road with extremely bad grades. The tram first began operating in June, approximately three months after the mill went into operation.

The tram is of the conventional two-track type with endless traction rope. From 30 to 32 buckets of 10 cu. ft. capacity are carried on the line and it is usually possible to handle a day's output during one 8-hour shift.



Compressor equipment includes this Chicago-Pneumatic Simplate Valve unit used as a standby.



Elvis Scott weighing concentrates at upper tram terminal before sending bucket on its way to Thompson Creek. Completion of the 3.4 mile aerial tramway eliminated 21 miles of trucking over tortuous mountain roads.

Storage capacity of 165 tons is available at the lower terminal, being divided between ten 10-ton storage units for loading trucks individually, and a 65-ton reserve storage bin. Each of the unit bins has a quick opening bottom which facilitates loading the big 10-ton General Motors trucks with semi-trailer bodies. Seven of these trucks are in regular use and one is maintained as a standby.

From Thompson Creek it is a 65 mile haul to Yreka, rail head for the Yreka & Western railroad. Storage capacity for 100 tons of concentrate is available at the track bins. Loading is accomplished by means of a shuttle conveyor pulled inside the car delivering to a Stephens-Adamson box car loader.

The loaded cars are transferred to the main Southern Pacific line for shipment to the AS&R smelter at Tacoma.

The Gray Eagle project provides good example of what can be accomplished with a small property in the way of essential war production. Similarly, it gives indication of the opportunities for future development in this relatively neglected section of California.

C

Sampling and Analysis Plan

Grey Eagle Mine Site, California
Preliminary Assessment/
Site Inspection
Sampling and Analysis Plan

Contract No.: 68-W6-0010
TDD No.: 09-99-02-0022

October 1999

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 9

Prepared by:

Tim Colen, START Project Manager
Ecology and Environment, Inc.

Superfund Technical Assessment and Response Team (START)

Preliminary Assessment/Site Inspection
Field Sampling Plan
Grey Eagle Mine, California

Contract No.: 68-W6-0010
TDD No.: 09-99-02-0022
PAN No.: 0402-GEST-XX

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Table of Contents

Section			Page
1	**Introduction**		**1-1**
	1.1	Statement of the Specific Problem	1-2
2	**Background**		**2-1**
	2.1	Site Location	2-1
	2.2	Site Description	2-1
	2.3	Site History	2-1
	2.4	Previous Site Investigations	2-4
		2.4.1 1996 Site Assessment	2-4
		2.4.2 1998 Assessment for Possible Removal Action	2-5
		2.4.3 1998 Short Term Removal/Removal Action Monitoring	2-5
3	**Objectives**		**3-1**
	3.1	Data Use Objectives	3-1
	3.2	Project Task/Sampling Objectives	3-1
	3.3	Action Level	3-1
	3.4	Decision Rule	3-2
	3.5	Data Quality Objectives	3-2
		3.5.1 Data Quality Objective (DQO) Process	3-2
		3.5.2 DQO Data Categories	3-2
		3.5.3 DQO Quality Indicators	3-2
	3.6	Project Organization	3-2
	3.7	Schedule of Sampling Activities	3-4
4	**Proposed Assessment and Sample Analyses**		**4-1**
	4.1	Sampling Rationale	4-1
		4.1.1 Stream Sediment Samples	4-1
		4.1.2 Surface Water Samples	4-1
	4.2	Analytes of Concern	4-5
5	**Analytical Methods and Procedures**		**5-1**
6	**Field Methods and Procedures**		**6-1**
	6.1	Field Procedures	6-1
		6.1.1 Equipment	6-1
		6.1.1.1 Equipment Calibration and Maintenance	6-1

Table of Contents (Cont.)

Section **Page**

6.1.2 Field Notes 6-1
6.1.2.1 Logbooks 6-1
6.1.2.2 Photographs 6-2
6.1.3 Field Measurements 6-3
6.1.3.1 Mapping Equipment 6-3
6.2 Sampling Procedures 6-3
6.2.1 Stream Sediment Samples 6-3
6.2.2 Surface Water Samples 6-3
6.3 Field Health and Safety Procedures 6-4

7 Disposal of Investigation-Derived Waste 7-1

8 Sample Identification, Documentation, and Shipment 8-1
8.1 Sample Numbering System 8-1
8.2 Sample Container, Preservative, and Holding Time Requirements 8-1
8.3 Sample Labeling, Packaging, and Shipping 8-1
8.4 Chain-of-Custody Forms 8-3

9 Quality Control 9-1
9.1 QA/QC Samples 9-1
9.1.1 Duplicates 9-1
9.1.2 Matrix Spike/Matrix Spike Duplicates 9-1
9.1.3 Background Sample 9-1
9.1.4 Field Blank Sample 9-1
9.2 Analytical and Data Package Requirements 9-2
9.3 Data Validation 9-3
9.4 Field Variances 9-3
9.5 Assessment of Project Activities 9-4

Appendices

A Data Quality Objectives Process Worksheet

B Client Request Forms

C Health and Safety Plan

List of Tables

Table		Page
3-1	Data Quality Indicator Goals — Sediment	3-3
3-2	Data Quality Indicator Goals — Surface Water	3-4
4-1	Request for Analytical Services, Matrix-Stream Sediment	4-3
4-2	Request for Analytical Services, Matrix-Surface Water	4-4
5-1	Analytical Methods and Requirements, Matrix-Soil/Sediment	5-1
5-2	Analytical Methods and Requirements, Matrix-Surface Water	5-2

List of Illustrations

Figure **Page**

2-1 Site Location Map 2-2

2-2 Site Map 2-3

4-1 Proposed Sampling Locations 4-2

List of Acronyms

bgs	below ground surface
CET	CET Environmental Services, Inc.
CLP	Contract Laboratory Program
DO	dissolved oxygen
DQIs	DQO quality indicator goals
DQO	Data Quality Objectives
E & E	Ecology and Environment, Inc.
ERRS	Emergency and Rapid Response Services
ft	feet
GC/MS	gas chromatograph/mass spectrometer
GPS	global positioning system
HPLC	high-performance liquid chromatography
HRS	Hazard Ranking System
IDW	investigation-derived wastes
km	kilometers
LCS	laboratory control samples
m	meters
m^3	cubic meters
MDL	method detection limit
mg/l	milligrams per liter
MS/MSD	matrix spike/matrix spike duplicate
NPL	National Priorities List
OERR	Office of Emergency and Remedial Response
ORP	oxidation-reduction potential
PA/SI	preliminary assessment/site inspection
PA	preliminary assessment
PE	performance evaluation
PM	Project Manager
PPE	personal protective equipment
QA/QC	quality assurance/quality control
QA	Quality Assurance
QAO	QA Officer
SAP	sampling and analysis plan
SOPs	standard operating procedures
START	Superfund Technical Assessment and Response Team
TDS	total dissolved solids
TM	Task Monitor
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
XRF	X-ray fluorescence spectrometer
yd^3	cubic yards

1 Introduction

The United States Environmental Protection Agency (USEPA) directed the Ecology and Environment, Inc. (E&E), Superfund Technical Assessment and Response Team (START) to conduct a preliminary assessment/site inspection (PA/SI) of the Grey Eagle Mine abandoned mine tailings site (Site) along Indian Creek, approximately five miles north of the town of Happy Camp, Siskiyou County, California (Latitude 41° 51' 27" North, Longitude 123° 23' 54" West).

This sampling and analysis plan (SAP) describes the project and data use objectives, data collection rationale, quality assurance goals, and requirements for sampling and analysis activities, and defines the sampling and data collection methods that will be used for this project. The SAP is intended to accurately reflect the planned data-gathering activities for this site investigation; however, site conditions and additional USEPA direction may warrant modifications. All significant changes will be documented in the final report.

The Site was identified in 1995 when members of the Karuk Indian Tribe, who were living adjacent to, and downstream from, the Site, met with Celia Bloomfield, the USEPA Indian program coordinator. Karuk Tribe members were concerned that the Site presented a potential threat to human health, the environment, and the Indian Creek watershed.

During the preliminary assessment (PA) consultation held with the USEPA Superfund Site Assessment Program in March 1999, USEPA decided to further evaluate the Site using USEPA's Hazard Ranking System (HRS) criteria. The HRS assesses the relative threat associated with actual or potential releases of hazardous substances to the environment, and has been adopted by USEPA to assist in setting priorities for further site evaluation and eventual remedial action. The HRS is the primary method for determining a

site's eligibility for placement on the National Priorities List (NPL). The NPL identifies sites where the USEPA may conduct remedial actions.

On March 3, 1999, START was tasked by USEPA Task Monitor Matt Mitguard to evaluate the Site under the HRS. START was also tasked to fill data gaps from the previous investigations and produce a PA/SI report, HRS score sheets, and an HRS rationale.

1.1 Statement of the Specific Problem

Metals, including copper, arsenic, lead, and mercury, are being leached from the tailings pile and transported by infiltrating groundwater. The acidic leachate discharges from seeps along the tailings pile into a drainage adjacent to the former millpond and then flows directly into Indian Creek. The leachate stream may also be increasing turbidity and potentially endangering the wildlife and fishery in Indian Creek. Concentrations of copper, iron, nickel, and zinc in the tailings have been documented to exceed the USEPA criteria for protection of aquatic life. Elevated concentrations of arsenic and mercury were also detected in the tailings. Historical discharges from the Grey Eagle Mine into Luther Gulch, a nearby tributary of Indian Creek, have been associated with historic fish kills and severe water quality impacts to Indian Creek.

2 Background

2.1 Site Location

The Site is approximately five miles (eight kilometers [km]) north of Happy Camp, Siskiyou County, California (Figure 2-1). The mine tailings pile is on the east side of Indian Creek, approximately 5.5 miles upstream of the confluence with the Klamath River, and approximately 0.2 mile southeast of the mouth of Luther Gulch, Latitude 41° 51' 27" North and Longitude 123° 23' 54" West (Figure 2-2). The Grey Eagle Mine is approximately 1.5 miles (2.5 km) northeast of the tailing pile, along Luther Gulch.

2.2 Site Description

The Site consists of the Grey Eagle Mine, and the tailings pile that occupies the southern portion of the McCoy property. A small tailings pile is located on a parcel of Forest Service land adjacent to the McCoy property. The main tailings pile exceeds 330 meters (m) (~1000 feet [ft]) long in the east-west direction, and 130 to 170 m (~400 to 500 ft) in the north-south direction. The pile is at least 7 to 8 m (~20 to 25 ft) deep across most of its area and contains an estimated 360,000 cubic meters (cm^3) (475,000 cubic yards [yd^3]) of sulfide-rich mine tailings. The tailings pile is bounded on the south by a 3- to 4-m-high slope.

2.3 Site History

Exploration and mining of copper, gold, and silver began in 1895; sulfide copper ores were mined sporadically prior to World War II under several operators. From 1941 to 1945, the Grey Eagle Mining Company (a subsidiary of Newmont Mining Company) operated an underground copper mine. The ore was milled at the mine, and the tailings were pumped to the present Site near the mouth of Luther Gulch, along Indian Creek. Along with copper, gold and silver were also extracted as byproducts from the ore. There is no evidence of activity at the mine from 1945 until 1981, during which time the mine was owned by the Standard Slag Company of Reno, Nevada. The Noranda Mining Company

Base map source: Compass Maps, 1992

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Fig 2-1.CDR-GRA

Figure 2-1

Site Location Map
Grey Eagle Mine Site
Siskiyou County, California

Base map source: Happy Camp Quad, CA 1980

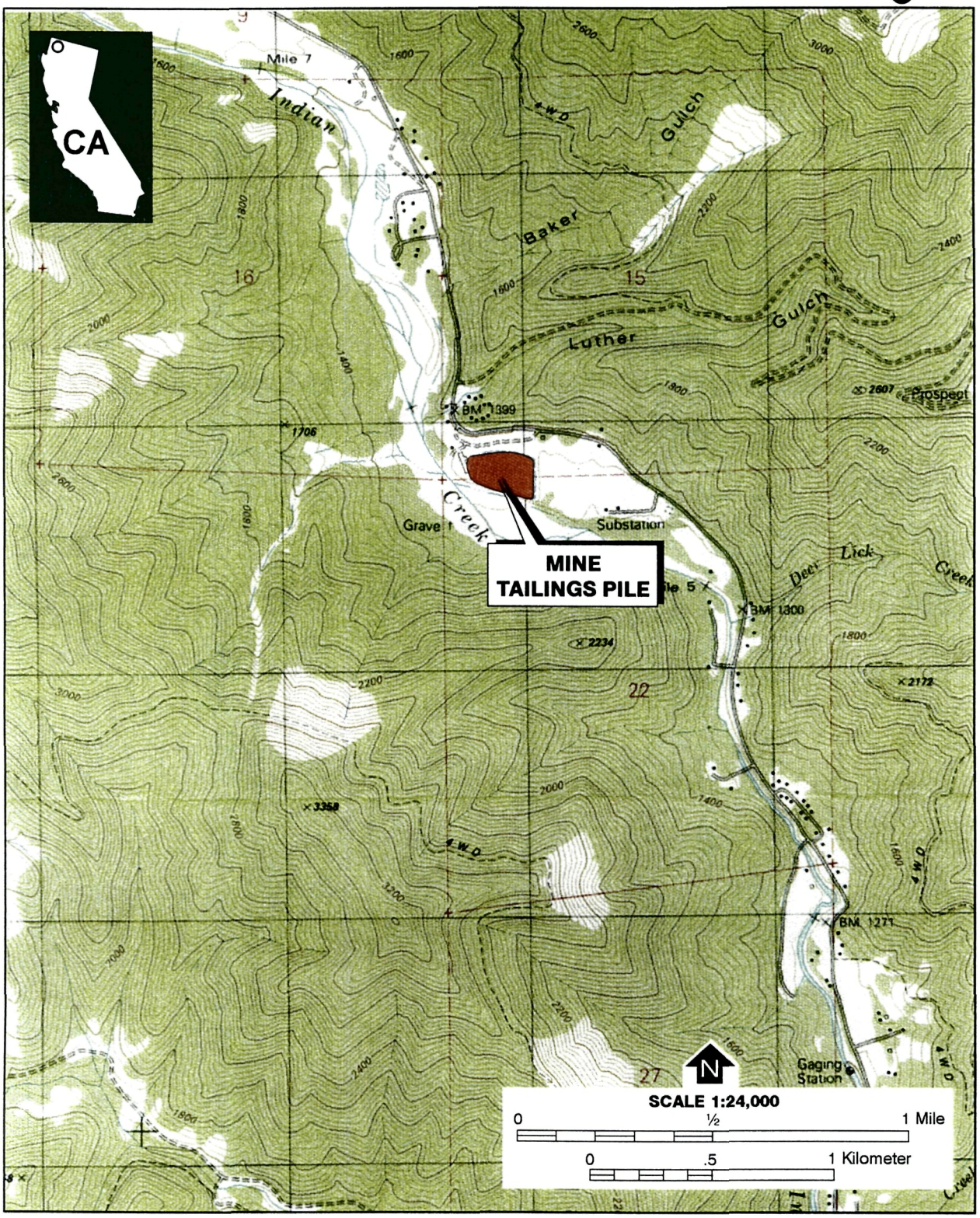

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Fig 2-2.CDR-GRA

Figure 2-2

Site Map
Grey Eagle Mine Site
Siskiyou County, California

reopened the Grey Eagle Mine to extract gold and silver from 1981 through 1986.

The tailings pile appears to have been formed during mining activities from 1941 to 1945, when tailings were transported by flume to the site. In about 1952, a depression approximately $4.2x10^4$ m^2 and 5 m deep ($4.5x10^5$ ft^2 area and 15 ft deep) was constructed in the tailings pile and utilized as a log pond by a saw mill. The mill was operated at the Site by the Willamette Lumber Company (Willamette) from 1945 to 1965. Croman Corporation owned the property from 1975 to 1990, and Siskon Gold Corporation owned the property from 1990 to 1996. There is no report of tailings having been discharged on the Site during the mining activity in the 1980s.

The Site is currently inactive, and the property is owned by B. McCoy, the former caretaker for the Siskon Gold Corporation of Grass Valley, California.

2.4 Previous Site Investigations

USEPA has conducted three investigations of the Site, one in 1996 and two in 1998.

2.4.1 1996 Site Assessment

A START site assessment was performed in April 1996. During this investigation, 39 surface soil and stream sediment samples were collected, along with four subsurface soil samples, at a depth of 1 foot below ground surface (bgs). The soil samples were analyzed for metals on site with an X-ray fluorescence (XRF) spectrometer. Nine of the collected soil samples were analyzed by an off-site environmental laboratory for metals, pH, sulfate, sulfide, and cyanide. Five water samples were collected along Indian Creek, upstream and downstream of the Site. All of the water samples were analyzed by an off-site environmental laboratory for static 96-hour bioassay, metals, pH, alkalinity, turbidity, sulfates, and cyanide.

Data from the sampling event indicated that conditions within the tailings pile are strongly oxidizing and acidic. A water sample taken from the leachate stream had a pH of 3.1, and the downstream effect of the tailings effluent was small but measurable (pH was 7.3 below the leachate stream, versus 7.8 above). Soils samples had rinsate pH values from 2.8 to 4.5. The high sulfate contents and high sulfate/sulfide ratios measured in tailings soil samples indicated that significant amounts of ferric iron were being

generated to produce iron sulfate at the expense of the primary sulfide mineralogy.

2.4.2 1998 Assessment for Possible Removal Action

In August 1998, START used a backhoe to excavate 10 exploratory trenches or pits on the McCoy property. The purposes of the excavations were to estimate the aerial extent of the tailings, assess the depth and degree of oxidation, establish groundwater conditions within and upgradient of the tailings pile, and attempt to determine the thickness of the tailings.

A stratigraphic cross section was developed to illustrate that much of the tailings deposit is non-oxidized. Much of this deposit is in the vadose zone, through which the existing oxidation front can be expected to migrate as long as oxygen and moisture are available. Photographs of the millpond were taken during the rainy season in 1996. These photographs show pools of standing water, suggesting that the water table fluctuates through the deposit from rainy to dry seasons. The 1998 investigation was performed during the dry season and probably represents the low stand for the water table. The percolation of millpond water and the seasonal fluctuation of the local water table likely facilitate the generation and migration of acid mine leachate and discharge of the leachate into Indian Creek. The process will probably continue for many decades, considering the small amount of section oxidized during the more than 50 years the deposit has been in place.

The two field investigations indicate that reactions are occurring in the tailings pile at pH values less than 2 and Eh values greater than +0.8 (near atmospheric). The waters percolating through the system are capable of transporting and depositing metals some distance away from the tailings pile.

2.4.3 1998 Short Term Removal/Removal Action Monitoring

From September 21, 1998 through November 25, 1998, START monitored a removal action performed by CET Environmental Services, Inc. (CET), an Emergency and Rapid Response Services (ERRS) contractor.

The objectives of the removal action were to remove the mine tailings from the Forest Service property; remove the western berm of the log pond and re-grade the slope to 2 percent; construct a 1.5 percent grade at the bottom of the log pond structure to provide adequate run off; install rip-rap at the base of the tailings pile near

Indian Creek to provide erosion control; and cap the surface of the tailings with plastic, then install native soil and vegetation to limit the infiltration of atmospheric oxygen into the tailings pile. All removed tailings were incorporated into the grading of the log pond, so no tailings were removed from the site.

The objective of stream water monitoring was to evaluate any effects of the removal action on Indian Creek. Water quality changes were evaluated by comparing leachate stream and downstream monitoring data to an upstream (background) monitoring point. Significant deviations from normal stream conditions, as defined by the background monitoring station, would require changes in the response activities to mitigate further releases.

Most parameters, except dissolved oxygen (DO) and oxidation-reduction potential (ORP), did not vary significantly between background and downstream locations. Temperature variations between the two locations did not exceed 5 percent. While there may be some exothermic properties associated with the influx of acid/metal-bearing waters from the Site, the temperature differences probably resulted from locality depth and stream flux. There was very little difference between specific conductance measurements from both locations; the greatest measured difference (0.007 ms/cm) is less than 5 percent of the average value recorded at either location. The pH values observed at the downstream location varied less than 2 percent from the background values. Turbidity did vary considerably between the background and downstream locations; these variations are largely incidental anomalies, with the background values for both locations remaining at zero.

The difference in DO concentrations between the background and downstream locations was significant. The difference between these stations is about 7 to 8 milligrams per liter (mg/L), or about 20 to 25 percent of the upstream concentrations during the first few days of measurement. This difference increases to over 10 mg/L toward the end of the monitoring interval; DO in the downstream location plummeted to as low as 5 percent of background. This degradation of oxygen content is also reflected in the ORP curve.

It is suggested that the drop in DO and ORP at the downstream monitoring station over the monitoring interval was the result of renewed flow from the leachate stream observed over the course of the monitoring interval. An increase in the influx of metal-rich waters would decrease the available DO. The buffering capacity of

Indian Creek water would maintain a relatively high pH, in spite of a higher influx of acidic water.

3 Objectives

3.1 Data Use Objectives

Sediment and surface water sample analytical data will be used to determine if the Site is impacting Indian Creek. The objective of this sampling event is to collect data that can be used to document whether a release to surface water of arsenic, copper, lead, mercury or other contaminants (sulfates, sulfides) has occurred and can be attributed to the Site.

Data generated by this field sampling may be used with an assessment of aquatic fauna performed by USEPA to determine whether the Site has impacted the Indian Creek habitat for spring chinook salmon (*Onchorynchus tshawytscha*), coho salmon (*Onchorhynchus kisutch*), and summer steelhead trout (*Onchorynchus mykiss*).

3.2 Project Task/Sampling Objectives

USEPA has tasked START to conduct sampling to characterize the stretch of Indian Creek up- and downstream of the Site to complete the HRS process. Surface water samples will be submitted for lab analyses of total and dissolved metals (i.e., arsenic, copper, lead, and mercury), sulfate, sulfide, and total dissolved solids (TDS). Stream sediment samples will be analyzed for total metals.

USEPA will also collect water quality parameters including pH, temperature, conductivity, and DO using a water quality meter.

3.3 Action Level

The action levels dictated by the HRS for this investigation are three times the background concentrations of individual metals found in surface water and sediment samples collected downstream of the tailings pile. START used USEPA's chronic ambient water quality criteria (AWQC) and the National Oceanic and Atmospheric Administration sediment screening criteria to develop maximum contract required detection limits for the metals of concern. AWQC are relevant HRS criteria, as well.

3.4 Decision Rule

If samples are found to be contaminated with any metals above the corresponding action levels, an observed release will be documented and integrated into the Site's HRS score.

3.5 Data Quality Objectives

3.5.1 Data Quality Objectives Process

The Data Quality Objectives (DQO) process, as set forth in the USEPA document, *Guidance for the Data Quality Objectives Process,* EPA QA/G-4, has been followed for this project. An outline of the process and the outputs for this project is included in Appendix A.

3.5.2 DQO Data Categories

This investigation will involve the generation of definitive data. The specific requirements for this data category are included in Section 9. The data generated under this project will comply with the requirements for this data category as defined in *Data Quality Objective Process for Superfund,* EPA 540/G-93/71. All definitive analytical methods employed for this project will be methods approved by USEPA.

3.5.3 DQO Quality Indicators

DQO quality indicator goals (DQIs) for this project were developed following guidelines in *EPA Guidance for Quality Assurance Project Plans,* EPA QA/G-5 Final, Appendix D. All sampling procedures detailed in Section 6.2 and standard operating procedures (SOPs) will be followed to ensure representativeness of sample results by obtaining characteristic samples. Tables 3-1 and 3-2 document the DQI goals for this project.

3.6 Project Organization

The following is a list of project personnel and responsibilities relative to the implementation of activities described in this SAP.

USEPA Task Monitor (TM) - The EPA TM is Matt Mitguard. Mr. Mitguard is the primary contact for the START project manager (PM) and is the primary decision maker for this investigation.

START Project Manager - The START PM is Tim Colen. Mr. Colen is responsible for the performance of tasks assigned to START by USEPA. Specifically, Mr. Colen is responsible for preparing the sampling analysis plan; contracting and working with

Table 3-1 Data Quality Indicator Goals — Sediment

Analyte or Parameter	Action Level (mg/kg)	Detection Limit (mg/kg)	Accuracy (Percent Recovery)	Precision (Relative Percent Difference)	Percent Complete
Laboratory QA Samples:					
Matrix Spike	N/A	N/A	50-200	N/A	90
Duplicates/ Replicates	N/A	N/A	N/A	≤50	90
Matrix Spike Duplicate	N/A	N/A	50-200	≤50	90
Lab QC Samples	N/A	N/A	70-130	N/A	90
Field Samples:					
Arsenic	Not available	2	N/A	N/A	90
Copper	34	5	N/A	N/A	90
Lead	46.7	0.6	N/A	N/A	90
Mercury	0.15	0.1	N/A	N/A	90

Key: Action level reflects NOAA effects range low value
mg/kg = milligrams per kilogram
N/A = Not applicable

a laboratory; implementing the sampling design; collecting, handling, documenting and transporting samples; generating field documentation of sampling activities; working with the START Quality Assurance (QA) officer to ensure project QA goals are met; and preparing a final report for submission to USEPA.

START Quality Assurance Officer (QAO) - The START QAO is Howard Edwards. Mr. Edwards will implement the QA plan for the project as described in the SAP and in the USEPA and START Quality Assurance Project plans. He will also oversee the contract laboratory and data validation activities performed on this project.

Analytical Laboratory - The laboratory is responsible for handling, analysis, and documentation of samples in accordance with the specified analytical method(s). Sediment samples will be analyzed through EPA's contract Laboratory Program Analytical Services (CLPAS) for total metals. Surface water samples will be analyzed by USEPA's Region 9 laboratory in Richmond, California, for sulfates, sulfides, and TDS. Client request forms for these analyses are found in Appendix B. The START will subcontract a

laboratory to analyze surface water samples for total and dissolved metals and hardness.

Table 3-2 Data Quality Indicator Goals — Surface Water

Analyte or Parameter	Action Level	Detection Limit	Accuracy (Percent Recovery)	Precision (Relative Percent Difference)	Percent Complete
Laboratory QA Samples:					
Matrix Spike	N/A	N/A	70-130	N/A	90
Duplicates/ Replicates	N/A	N/A	N/A	≤20	90
Matrix Spike Duplicate	N/A	N/A	70-130	≤20	90
Lab QC Samples	N/A	N/A	70-130	N/A	90
Field Samples:					
Arsenic by EPA Method 200.8	190 µg/L	1 µg/L	N/A	N/A	90
Copper by EPA method 200.8	12 µg/L	1 µg/L	N/A	N/A	90
Lead by EPA method 200.8	3.2 µg/L	1 µg/L	N/A	N/A	90
Mercury by EPA method 1631B	0.012µg/L	0.0005 µg/L	N/A	N/A	90
Sulfide by EPA 9034	3X Background	0.2 mg/L	N/A	N/A	90
Sulfate by EPA 9056	3X Background	1 mg/L	N/A	N/A	90
Hardness by EPA 130.2	3X Background	10 mg/L	N/A	N/A	90
TDS by EPA 160.1	3X Background	1 mg/L	N/A	N/A	90

Key: Action levels for metals based on chronic fresh water ambient water quality criteria
mg/L = Milligrams per liter
µg/L = Micrograms per liter

3.7 Schedule of Sampling Activities

It is anticipated that sampling will take place during October 1999.

4 Proposed Sample Analyses

4.1 Sampling Rationale

4.1.1 Stream Sediment Samples

Sediment samples will be collected from 13 locations to document the presence of total metals (arsenic, copper, lead, and mercury) (Figure 4-1). Two background sediment samples will be collected upstream from the outfall of Luther Gulch into Indian Creek. One sample will be collected from Luther Gulch to characterize its discharge. Sediment samples will be collected at five locations along the tailings pile and leachate stream. Five downstream locations will be sampled, including one above the outfall of Indian Creek into the Klamath River and two from the Klamath River, both above and below the Indian Creek outfall.

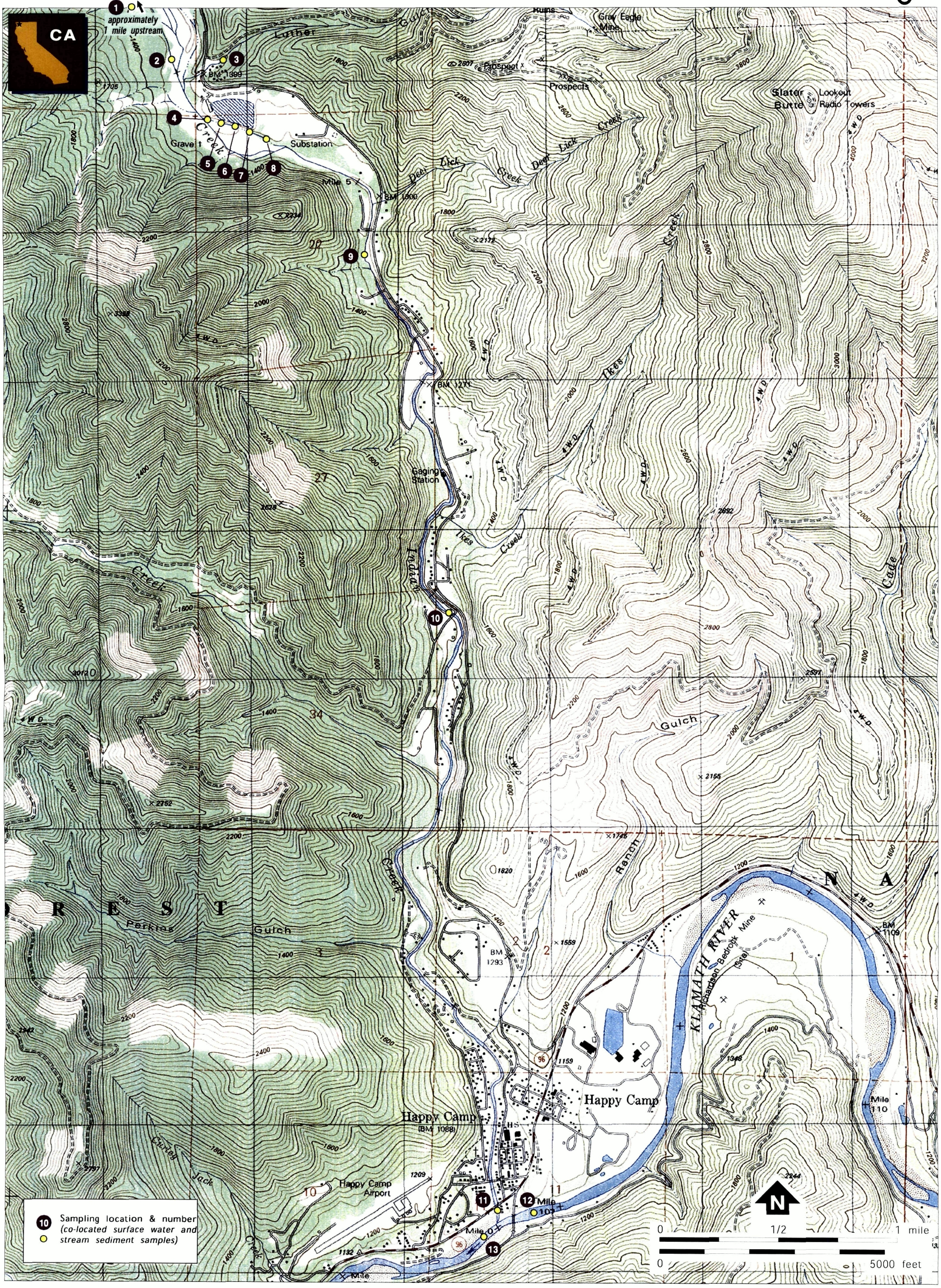
To the extent possible, the START will begin collecting stream sediment samples at the farthest downstream location and will end at the farthest upstream location. This is intended to minimize cross-contamination of samples by not allowing upstream sediments to contaminate downstream sample locations.

Tables 4-1 and 4-2 list the requested analytical services for sediment and surface water samples.

4.1.2 Surface Water Samples

Surface water samples will be co-located where possible, with the 13 stream sediment samples discussed above (see Figure 4-1). Since sampling is expected to take place during the lower-flow fall months, samples will be collected by wading into the active portion of the stream channel and immersing the sample bottles into the stream. If flowing water is not available, surface water samples will not be collected.

Base map source: *TOPO! Interactive Maps for Mount Shasta,Lassen Wilderness, and the Trinity Alps* (based on 1:24,000 USGS topographic quadrangles)



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TDD: 09-9902-0022
PAN: 0402-GEST-XX
Date: 08/20/98
File: Z.41

Figure 4-1

Sampling Locations Map

Grey Eagle Mine Site

Klamath National Forest, Siskiyou County, California

Table 4-1 Grey Eagle Mine Site: Request for Analytical Services Matrix — Stream Sediment

Analyses Requested					Metals by CLPAS
Sample Container					8-oz glass
Preservatives:					4^0 C
Analytical Holding Times					6 months 28 days for Hg
Contract Holding Times					14 days
Sample No.	**Sample Location**	**Sample Depth**	**Concen-tration**	**QA/QC**	**No. of containers**
GESS-1	Indian Creek above Luther Gulch	0 to 6 inches	Low		1
GESS-2	Indian Creek above Luther Gulch				1
GESS-3	Luther Gulch				1
GESS-4	Indian Creek near mine tailings				1
GESS-5	Indian Creek near mine tailings				1
GESS-6	Indian Creek near mine tailings			MS/MSD	2
GESS-7	Indian Creek near mine tailings				1
GESS-8	Indian Creek near mine tailings				1
GESS-9	Indian Creek below mine tailings				1
GESS-10	Indian Creek below mine tailings				1
GESS-11	Indian Creek below mine tailings				1
GESS-12	Klamath River above Indian Creek				1
GESS-13	Klamath River below Indian Creek				1
GESS-14	Indian Creek near mine tailings			Duplicate of GESS-5	1
GESS-15	Indian Creek below mine tailings			Duplicate of GESS-10	1
Totals					16

Table 4-2 Grey Eagle Mine Site: Request for Analytical Services Matrix — Surface Water

Analyses Requested		Total and Dissolved Metals (As, Cu, Pb) 200.8		Total + dissolved Mercury by 1631B	TDS by 160.1	Sulfide by 9034	Sulfate by 9056	Hardness by 130.2
Sample Container		1 L poly		500 ml teflon	500 mL poly	500 mL poly	500 mL poly	250 ml poly
Preservatives		Total: HNO_3 to pH <2 then ice to 4^0 C Dissolved to 8^0 C		4^0 C preservation by lab	Ice to 4^0 C	Zn acetate plus NaOH, then ice to 4^0C	Ice to 4^0 C	Ice to 4^0 C, HNO_3 to pH<2
Analytical Holding Times		6 months		48 hours to preservation, 28 days	7 days	7 days	7 days	6 months
Contract Holding Times		14 days		14 days	7 days	7 days	7 days	14 days
Sample No.	**Sample Location**	**Concentration**	**QA/QC**	**No. of containers**	**No. of containers**	**No. of containers**	**No. of containers**	**No. of containers**
GESW-1	Indian Creek above Luther Gulch	Low		2	2	1	1	1
GESW-2	Indian Creek above Luther Gulch			2	2	1	1	1
GESW-3	Luther Gulch			2	2	1	1	1
GESW-4	Indian Creek near mine tailings			2	2	1	1	1
GESW-5	Indian Creek near mine tailings			2	2	1	1	1
GESW-6	Indian Creek near mine tailings		MS/MSD	6	6	3	3	1
GESW-7	Indian Creek near mine tailings			2	2	1	1	1
GESW-8	Indian Creek near mine tailings			2	2	1	1	1
GESW-9	Indian Creek below mine tailings			2	2	1	1	1
GESW-10	Indian Creek below mine tailings			2	2	1	1	1
GESW-11	Indian Creek below mine tailings			2	2	1	1	1
GESW-12	Klamath River above Indian Creek			2	2	1	1	1
GESW-13	Klamath River below Indian Creek			2	2	1	1	1
GESW-14	Indian Creek near mine tailings		Duplicate of GESS-5	2	2	1	1	1
GESW-15	Indian Creek below mine tailings		Duplicate of GESS-10	2	2	1	1	1
FB-1	At field staging area		Field Blank	2	2	1	1	1
Totals				36	36	18	18	16

As with the stream sediment samples, START will begin collecting surface water samples at the farthest downstream sample location, and will end at the farthest upstream location to minimize potential cross-contamination of the samples.

4.2 Analytes of Concern

As previously discussed in this plan, the 1996 site assessment documented the presence of metals, including copper, arsenic, lead, and mercury, in the tailings at the site.

Sediment samples will be analyzed for total metals using EPA's Contract Laboratory Program Analytical Services (CLPAS).

Surface water samples will be analyzed for sulfates, sulfides, and TDS by USEPA's Region 9 laboratory in Richmond, California. Client request forms for these analyses are provided in Appendix B.

The START will subcontract a laboratory to analyze surface water samples for total and dissolved metals and hardness.

5 Analytical Methods and Procedures

Sediment samples will be analyzed through the CLPAS for total metals (arsenic, copper, lead, and mercury) only. All surface water samples collected at the site will be submitted for total and dissolved metals analysis by EPA methods 200.8 and 1631B series for total metals (see tables 5-1 and 5-2). EPA methods 9034 and 9056 will be used for sulfide and sulfate, respectively. Surface water samples will be analyzed for TDS by EPA Method 160.1. Tables 5-1 and 5-2 also summarize sample containers, preservatives, and holding times.

The following measures will be used to provide analytical quality control for the analytical program:

- A double volume of water and sediment will be collected for one sample for each analytical method to be utilized for matrix spike/matrix spike duplicate (MS/MSD) analysis.
- A Contract Laboratory Program (CLP)-type (Level IV) data package will be required from the laboratory for all resultant data.

Table 5-1 Analytical Methods and Requirements: Matrix-Soil/Sediment

Method	Metals by CLPAS
Sample Container	8-oz. glass
Preservation	4°C
Extraction Holding Time	6 months
Analysis Holding Time	6 months
Number of Samples	15
Lab Samples	13
Duplicates	2
MS/MSDs	1
Total Samples	15

Table 5-2 Analytical Methods and Requirements: Matrix-Surface Water

Method	Total and dissolved metals by 200.8	Mercury by 1631B	TDS by 160.1	Sulfate by 9056	Sulfide by 9034	Hardness by 130.2
Sample Container	1 liter poly	500 ml teflon	500 ml poly	500 ml poly	500 ml poly	250 ml poly
Preservation	Total: HNO_3 < pH 2 4°C Dissolved: 4°C	4°C preservation by lab	4°C	4°C	4 drops 2N zinc acetate per 100 mls of sample, 6N NaOH pH > 9, No headspace, 4°C	HNO_3 < pH 2 4°C
Extraction Holding Time	6 months	N/A	N/A	N/A	7 days	N/A
Analysis Holding Time	6 months	48 hours to preservation, 28 days	7 days	28 days	7 days	6 months
Number of Samples	32	32	16	16	16	16
Lab Samples	26	26	13	13	13	13
Duplicates	4	4	2	2	2	2
MS/MSDs	1 per 20 samples	1 per 20 samples	N/A	1 per 20 samples	1 per 20 samples	N/A
Field Blank Sample	2	2	1	1	1	1
Total Samples	32	32	16	16	16	16

6 Field Methods and Procedures

6.1 Field Procedures

6.1.1 Equipment

The following equipment will be used to obtain environmental samples from the respective media:

Parameter : Metals		
Matrix : Sediments		
Equipment	**Fabrication**	**Dedicated**
By hand or hand trowel	Steel (trowel)	No
Sample mixing buckets	Paper	Yes

Parameter : Metals, Sulfate, Sulfide, and Hardness		
Matrix : Surface Water		
Equipment	**Fabrication**	**Dedicated**
Filling bottles by hand	Polyethylene or Teflon™	Yes

6.1.1.1 Equipment Calibration and Maintenance

USEPA will collect water quality parameter data, including pH, temperature, DO, and specific conductance on a water-quality meter.

6.1.2 Field Notes

6.1.2.1 Logbooks

Field logbooks will document where, when, how, and from whom any vital project information was obtained. Logbook entries will be complete and accurate enough to permit reconstruction of field activities. A separate logbook will be maintained for each project. Logbooks will be bound with consecutively numbered pages. Each

page will be dated and the time of entry noted in military time. All entries will be legible, written in ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions. At a minimum, the following information will be recorded, as appropriate for the type of sampling, during the collection of each sample:

- Sample location and description
- Site sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or grab
- Type of sample (matrix)
- Type of sampling equipment used
- On-site measurement data (e.g., temperature, pH, conductivity)
- Field observations and details important to analysis or integrity of samples (e.g., sediment grain size, rain, odors)
- Preliminary sample descriptions
- Type(s) of preservation used
- Chain of custody form numbers
- Shipping arrangements (air bill numbers)
- Receiving laboratory(ies)

In addition to sampling information, the following specifics will also be recorded in the field logbook for each day of sampling:

- Team members and their responsibilities
- Time of arrival/entry on site and time of departure
- Other personnel on site
- A summary of meetings or discussions with any potentially responsible parties, or representatives of any federal, state, or other regulatory agency
- Deviations from sampling plans, site safety plans, and QA procedures
- Changes in personnel and responsibilities, as well as reasons for the change
- Levels of safety protection
- Calibration information for equipment used on site
- Record of photographs

6.1.2.2 Photographs

Photographs will be taken at representative sample locations and at other areas of interest on site. They will serve to verify information entered in the field logbook. When a photograph is taken, the following information will be written in the logbook or will be recorded in a separate field photography log:

- Time, date, location, and, if appropriate, weather conditions
- Description of the subject photographed
- Name of person taking the photograph
- Film frame number

6.1.3 Field Measurements

6.1.3.1 Mapping Equipment

Sample points and site features will be documented with a global positioning system (GPS) unit. GPS mapping will be performed by personnel trained in the use of the equipment, and will be completed in accordance with manufacturer's instructions. In addition, GPS locations and file numbers, sample numbers, and other useful field data will be recorded in a field logbook.

6.2 Sampling Procedures

As noted in Section 4.1, sediment and surface water sample locations will be recorded in the field logbook as sampling is completed, and will also be recorded using GPS.

6.2.1 Stream Sediment Samples

Fifteen sediment samples will be collected to document the presence of metals. Samples will be collected from sediments with large surface-to-volume ratios, such as fine-grained sands, silts, and clays, rather than from coarser sediments, such as sands and gravels. In rivers and streams, these fine-grained sediments are often deposited on the insides of bends, and downstream from small islands and other obstructions.

Sediment samples will be collected either by hand trowels or by gloved hand from locations within Indian Creek, Luther Gulch, or the Klamath River, and will be transferred directly to a sample bucket for homogenization. Material in the pail will be transferred into the appropriate sample container. Sample containers will be filled to the top with measures taken to prevent sediment from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. After sample containers are filled, they will be immediately sealed and chilled.

6.2.2 Surface Water Samples

Fifteen surface water samples will be collected at the same locations as the stream sediment samples to document the presence of metals. Sample locations are described in Section 4. Because sampling is scheduled to take place during the lowest flow regime of the year, not all sample locations, particularly along the tailings pile, may yield sufficient water to sample. If that is the case, only a stream sediment sample will be collected at that location.

Surface water samples will be collected by wading into the active portion of the channel and immersing the bottles into the stream. Sampling will commence at the farthest downstream location and will end at the farthest upstream location. Care will be taken not to agitate the streambed near the sample collection point. This is intended to minimize cross-contamination of the samples by not allowing upstream sediments to contaminate downstream sample locations.

6.3 Field Health and Safety Procedures

All field activities will be conducted under the Site's health and safety plan (Appendix C). In general, work will be conducted on site in Level D.

7 Disposal of Investigation-Derived Waste

In the process of collecting environmental samples at the Site, the site investigation team will generate different types of potentially contaminated investigation-derived wastes (IDW), including used personal protective equipment (PPE) and disposable sampling equipment.

The USEPA's National Contingency Plan requires that management of IDW generated during site investigations comply with all relevant or appropriate requirements to the extent practicable. This sampling plan will follow the *Office of Emergency and Remedial Response (OERR) Directive* 9345.3-02 (May 1991), which provides the guidance for management of IDW during site investigations. Listed below are the procedures that will be followed for handling IDW. The procedures have enough flexibility to allow the site investigation team to use its professional judgment regarding the proper method of disposal for each type of IDW generated at each sampling location.

- Used PPE and dedicated sampling equipment will be double-bagged in plastic trash bags and disposed of in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill. Any PPE and disposable equipment to be disposed of, but which can still be reused, will be rendered inoperable before disposal.

8 Sample Identification, Documentation, and Shipment

8.1 Sample Numbering System

An unique, identifiable name will be assigned to each sample. The sample prefix "KA-" will identify samples as being from this assessment. The remainder of the sample name will consist of sequential two-digit numbers (which can be correlated to the grid coordinate for the sample location using the field logbook), followed by a two-digit number indicating the sample depth. QA samples will be assigned fictitious names. Every sample, even those collected from a single location but going to separate laboratories, will be assigned a unique, identifiable name.

8.2 Container, Preservation, and Holding Time Requirements

Container, preservation, and holding time requirements are summarized in tables 5-1 and 5-2. All sample containers used will have been delivered to the START in a pre-cleaned condition. Preservatives, if required, will be added by the START to the containers for field, duplicate, MS/MSDs, and blank samples prior to shipment of the sample containers to the laboratory.

8.3 Sample Labeling, Packaging, and Shipping

All samples collected will be labeled clearly and precisely for proper identification in the field and for tracking in the laboratory. Sample labels will be affixed to the sample containers and secured with clear tape. Sample numbers will be assigned in accordance with guidelines stipulated in Section 8.1. The sample labels will contain the following information:

- Sample number
- CLP case number, if sample is going to a CLP lab
- Station location
- Date and time of collection
- Site name
- Analytical parameter(s) requested and method of preservation

Samples will be stored on ice in a secure location pending shipment to the laboratory. Sample coolers will be retained in the custody of site personnel at all times, or will be secured so as to deny access to anyone else. The procedures for handling samples for shipping are as follows:

- When ice is used, it will be packed inside two zip-locked plastic bags. The drain plug of the cooler will be sealed with tape to prevent melting ice from leaking.
- The bottom of the cooler will be lined with bubble wrap to prevent breakage during shipment.
- Screw caps will be checked for tightness.
- Sample containers will have custody seals affixed so as to prevent the container from opening without breaking the seal.
- All glass sample containers will be protected by bubble wrap.
- All sample containers will be sealed in heavy-duty plastic bags. Sample numbers will be written in indelible ink on the outside of the bags.

All samples will be placed in coolers with the appropriate chain-of-custody forms. All forms will be enclosed in plastic bags and affixed to the underside of the cooler lid. Bags of ice will be placed on top of, and around, samples. Empty space in the cooler will be filled with bubble wrap to prevent movement and breakage during shipment. Each ice chest will be securely taped shut with strapping tape, and custody seals will be affixed to each cooler.

Samples will be shipped for immediate delivery to the laboratory. Upon shipping, the EPA Region 9 regional sample control coordinator (RSCC), will be notified of the following information:

- Sampling contractor's name
- The name of the site
- Case number
- Shipment date and expected delivery date
- Total number of samples by matrix and for each sample the relative level of contamination (i.e., low, medium, or high)
- Carrier, air bill number(s), method of shipment (e.g., priority)
- Irregularities or anticipated problems associated with the samples
- Whether additional samples will be sent, or if this is the last shipment

The RSCC will be notified daily (Gail Jones, phone 415-744-1498) of the sample shipment schedule (Friday shipments must be reported no later than noon) and will be provided with the above-listed information.

8.4 Sample Traffic Reports, Chain-of-Custody Records, and QA/QC Summary Forms

For samples sent through the CLPAS, organic and inorganic traffic reports will be used to document sample collection and shipment to a laboratory for analysis. One form will be completed and sent with the samples for each laboratory and each shipment. If multiple coolers are sent to a single laboratory on a single day, only one form will be completed. If all sample information cannot be entered on one form, then multiple forms will be used. The top copy of the form will be sent to the QAO, the second copy will be sent to Contract Laboratory Analytical Services Support, and the remaining copies will accompany the samples to the laboratory. A photocopy of the original will be made for the E & E master files.

For samples that will be sent through the Regional Analytical Program (RAP), EPA Region 9 RAP chain-of-custody forms will be used to document sample collection and shipment to a laboratory for analysis. One form will be completed and sent with the samples for each laboratory and each shipment. If multiple coolers are sent to a single laboratory on a single day, only one form will be completed. If all sample information cannot be entered on one form, multiple forms will be used. The top copy of the form will accompany the samples to the laboratory, and the second copy will be sent to the QAO. A photocopy of the original will be made for the E & E master files.

A quality assurance/quality control (QA/QC) summary form will be completed for each laboratory and each matrix of the sampling event. The sample numbers for all blanks, reference samples, laboratory QC samples, and duplicates will be documented on this form. The original form will be sent to the QAO; a photocopy will be made for the E & E master file.

All sample shipments will be accompanied by a chain-of-custody record, from the time the sample is taken to its final disposition. The chain-of-custody record will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in a person's custody if it is either in their physical possession or in their view, locked up, or kept in a secured area that is restricted to authorized personnel. When samples are not in the custody of the individual(s) responsi-

ble for them, they must be stored in a locked container sealed with a custody seal. The chain-of-custody must include the following:

- Sample identification numbers
- Site name
- Sample date(s)
- Numbers and volumes of sample containers
- Required analyses
- Signature and name of samplers
- Signature of any individual(s) with custody over samples
- Airbill number
- Note(s) indicating special holding times and/or detection limits

Every transfer of custody must be noted and signed for on the record, a copy of which will be kept by each individual who has signed. The proper distribution of paperwork will vary depending on which analytical program the samples will be sent to.

Instructions for Sample Shipping and Documentation, (Quality Assurance Management Section, U.S. EPA Region 9, San Francisco, CA, November 1997) will be taken to the field as a reference. Corrections on sample paperwork will be made by drawing a single line through the mistake and initialing and dating the change. The correct information will be entered above, below, or following the mistake.

9 Quality Control

9.1 QA/QC Samples

The QA/QC samples described in the following subsections, which are also listed in tables 5-1 and 5-2, will be collected during this investigation.

9.1.1 Duplicates

Duplicate samples are collected to evaluate whether the sampling procedures and analysis results are reproducible. The definitive data category requires that at least 10 percent of samples analyzed must be duplicates. Two duplicate samples will be collected for metals analysis, one from an area of expected high contaminant concentration (e.g., locations 5-8) and a second from an expected low concentration area (e.g., location 1). Duplicates will be submitted "blind" to the laboratory for analysis.

9.1.2 Matrix Spike/Matrix Spike Duplicates

A laboratory QC sample, called an MS/MSD, is not an extra sample; rather, it is a sample that requires additional QC analyses and, therefore, requires a larger sample volume. The chain-of-custody records for these samples will identify them as laboratory QC samples. At a minimum, one MS/MSD sample per 20 samples, per matrix for each analytical parameter, will be submitted. If the DQI criteria listed in tables 3-1 and 3-2 are not achieved, further data review will be conducted to assess the impact on data quality.

9.1.3 Background Sample

Two background samples will be collected in this assessment. Results will also be compared to ambient water quality criteria and NOAA sediment screening guidelines.

9.1.4 Blank Samples

Equipment blanks will not be collected because all sampling equipment will be dedicated. One field blank sample will be collected for this sampling event by pouring de-ionized water into sample bottles.

9.2 Analytical and Data Package Requirements

The data package shall include all original documentation generated in support of this project. In addition, the lab shall provide original documentation to support that all requirements of the methods have been met. This includes, but is not limited to, custody records, shipping information, sample preparation/extraction records, and instrument printouts such as mass spectra. Copies of information and documentation required in this document are acceptable. The following deliverables, as they apply to the method being used, are required. (Note that the following data requirements are included to specify and emphasize general documentation requirements, and are not intended to supersede or change requirements of each method:

- Copy of the chain-of-custody, sample log-in records, and a case narrative describing the analyses and methods used, and, if necessary, the presence of any interferences and the failure of the lab to meet any of the requirements or re-analyses

- Analytical data (results) for up to three significant figures for all samples, method blanks, MS, laboratory control samples (LCS), duplicates, performance evaluation (PE) samples, and field QC samples

- QC summary sheets: EPA CLP-equivalent forms which summarize the following:

  - MS/MSD/LCS recovery summary.
  - Method/preparation blank summary.
  - Initial and continuing calibration summary.
  - Sample holding time and analytical sequence (e.g., extraction and analysis).
  - Calibration curves and correlation coefficients.
  - Duplicate summary.
  - Detection limit information.

- Analyst bench records describing dilution, weighing of samples, percent moisture (solids), sample size, sample extraction and cleanup, final extract volumes, and amount injected

- Detailed explanation of the quantitation and identification procedure used for specific analyses, giving examples of calculations from the raw data

- The final deliverable report with of sequentially numbered pages

- Raw versus enhanced spectra and enhanced versus reference spectra data provided for every compound identified in each field sample

- For target analytes, the reference spectrum shall be the check standard for that sample

9.3 Data Validation

START will be responsible for reviewing all definitive data received and for validating of the data. Because the data may be used to support the HRS score for the site, 100 percent of the data will be validated. When the data have been validated, they will be classified as acceptable for use without qualifications, acceptable for use with qualifications, or unacceptable for use.

To meet requirements for categorization as definitive data, the following criteria must be evaluated:

- Holding times
- Sampling design approach
- Blank contamination
- Initial and continuing calibration
- Detection limits
- Analyte identification and quantitation
- Matrix spike recoveries
- Performance evaluation samples when specified
- Analytical and total error determination
- Lab control samples

Reported sample, sample replicates, and QC sample results will be verified against raw data.

9.4 Field Variances

As conditions in the field vary, it may become necessary to implement modifications to the proposed sampling presented in this plan. When appropriate, the START QA officer will be notified of the modifications and will receive a verbal approval obtained before implementing the modifications. Modifications to the approved plan will be recorded in site records and reported in the post-sampling report.

9.5 Assessment of Project Activities

This section addresses only those data quality assessment activities to be performed by the START personnel. The following assessment activities will be performed:

- All project deliverables (SAP, Data Summaries, Data Validation Reports, Investigation Report) will be peer-reviewed prior to being submitted to USEPA. In time-critical situations, the peer review may occur concurrently with the submission of a draft document to USEPA. The reviewer will report errors discovered in the peer review process to the originator of the document, who will be responsible for taking corrective action.

- The START QAO will review project documentation (logbooks, chain-of-custody forms, etc.) to ensure the SAP was followed and that sampling activities were adequately documented. The START QAO will document deficiencies and the PM will be responsible for corrective actions.

A

Data Quality Objectives Process Worksheet

The Data Quality Objectives Process Worksheet for the Grey Eagle Mine Tailings Site

1) **State the Problem** To collect sediment and surface water samples to determine whether the inactive Grey Eagle Mine tailings pile has had, or continues to have, an impact on Indian Creek, adjacent to the site.

2) **Identify members of the planning team**
Matt Mitguard, EPA Task Monitor
Jim James, E & E START, Project Director
Tim Colen, E & E START, Project Manager
Howard Edwards. E & E START, Quality Assurance Officer

Identify the primary decision maker
Matt Mitguard, EPA Task Monitor

Develop a concise description of the problem
The mill tailings pile contains elevated concentrations of metals. Additional data are required to determine background concentrations of metals in the sediments and surface water. A leachate stream (seeps) originating from the tailings pile may be impacting the sediments and biota of Indian Creek. The tailings pile itself may be impacting the surrounding ground and surface waters of Indian Creek. Additional data are required to determine the potential impacts to sediment, surface water, and biota.

3) **Identify the Decision** - Identify the decision that requires new environmental data to address the contamination problem.

Identify the principal study question
Do concentrations of metals in downstream surface water and sediments exceed three times the concentrations found in similar background samples or exceed ambient water quality criteria?

Define the alternative actions that could result from the resolution of the principal study question.
If the sampling of sediments, surface water, and/or aquatic fauna document that the Grey Eagle tailings pile has had an impact on the sediments or water of Indian Creek, the site's Hazard Ranking Score may make it eligible for inclusion on the National Priorities List (NPL).

If sampling failed to document an impact on Indian Creek attributable to the site, the mine site may not be eligible for the NPL or Superfund remedial resources.

Combine the principal study question and the alternative actions into a decision statement
Determine whether or not the mine tailings contain concentrations of heavy metals greater than three times the concentrations found in similar background samples.

Organize multiple decisions
Determine if mine tailings are impacting local sediments and surface waters of Indian Creek.

4) **Identify Inputs to the Decision** - Identify the information needed to support the decision, and specify which inputs required new environmental data.

Identify the information that will be required to resolve the decision statement
Data are required from chemical analyses of surrounding native soils, stream sediments, surface water, and biota of Indian Creek.

Determine the source(s) for each item of information identified
Previous sampling and planned sampling during the PA/SI

Identify the information that is needed to establish the action level
An action level will be established following sampling for sediments, surface water, or aquatic fauna that exceed three times background concentrations.

Confirm that appropriate measurement methods exist to provide the necessary data
EPA Methods 200.8 and 1631B series for metals, EPA Method 9040B + 9045C for pH, EPA Method 9034 for sulfide, EPA Method 9056 for sulfate, EPA Method 160.1 for Total Dissolved Solids (TDS).

5) **Define the Study Boundaries** - Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision. Specify the characteristics that define the population being studied

Define the spatial boundary of the decision statement
The spatial boundaries are sediments, surface water, and biota at appropriate upstream and downstream locations along Indian Creek in the vicinity of the tailings pile. Sample locations will be determined in the field based on conditions such as stream flow levels and accessibility.

Define the temporal boundary of the decision statement
Because biased sampling will be conducted, conditions for sampling are probably most favorable during a low flow regime, during fall.

Identify the practical constraints on data collection
Other than field logistics relating to access and safety, no constraints are anticipated on data collection.

6) **Develop a Decision Rule** - Develop a logical "if...then" statement that defines the conditions that would cause the decision maker to choose among alternative actions.

Specify the statistical parameter that characterizes the population of interest
Individual data values, not statistical parameters, will be evaluated against the action level

Specify the action level for the study
The study's action level is triggered for samples that contain metals at three times the concentrations of those found in similar background samples of sediments or surface water, and exceed ambient water quality criteria.

Develop a decision rule
If samples of sediments or surface water, collected in the vicinity or downstream of the Grey Eagle tailings pile contain concentrations of metals that exceed three times those of similar background samples, then an impact attributable to the site has been documented. The site may be eligible for the NPL.

7) **Specify the Limits on Decision Errors** - Specify the decision makers acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data.

Determine the possible range of the parameter of interest
The concentration ranges of heavy metals found in samples are expected to range from the method detection limits to several hundred or possibly a few thousand parts per million.

Identify the decision errors and choose the null hypothesis
Baseline condition (Null hypothesis) - The concentration meets or exceeds the action level. The alternative hypothesis - The concentration is less than the action level.

False positive = The results show the concentration is greater than or equal to the action level when it is actually not

False negative = The results show the concentration is less than the action level when it is actually not

Specify a range of possible values of the parameter of interest where the consequences of decision errors are relatively minor (gray region)
Decision errors will have minor consequences when the concentrations of heavy metals samples are below environmental benchmarks even though they might otherwise be significant, i.e., exceed three times background concentrations.

Assign probability values to points above and below the action level that reflect the probability for the occurrence of decision errors

8) **Optimize the Design for Obtaining Data** - Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQOs.

Please refer to the Grey Eagle Mine Sampling Plan and Analysis. This document identifies the most resource-effective sampling and analysis design for generating data required to satisfy the DQOs.

B Client Request Forms

U. S. ENVIRONMENTAL PROTECTION AGENCY REGION 9
Environmental Services Branch

75 Hawthorne Street
San Francisco, CA 94105
Phone: 415/744-1498

SITE NAME: Grey Eagle Mine
CASE/RAP No.:

REGIONAL ANALYTICAL PROGRAM CLIENT REQUEST FORM

The analysis of low concentration water for total dissolved solids (TDS) by EPA Method 160.1 (Gravimetric, dried at 180°C).

1. **Definition and number of work units involved (specify whether whole samples or fraction; specify sample matrices and concentration levels):**

   Twenty (20) whole surface water samples of low concentration.

2. **Estimated date(s) of collection (provide a sampling schedule):**

   October 13 through 15, 1999

3. **Estimated date(s) and method of shipment:**

   Overnight courier - samples are to be shipped on the day of collection for next day delivery including Saturday deliveries. Laboratory must be capable of accepting Saturday deliveries.

4. **Number of days analysis and data required after laboratory receipt of samples:**

   a. The contract required analysis holding time is 5 days from the date of sample receipt by the laboratory.

   b. The technical holding time for sample analysis is 7 days from the date of sample collection.

   c. Data packages and all other deliverables are required within 35 days from receipt of last sample in each sample delivery group (SDG). A SDG is defined as the following, whichever is most frequent:

      - Each case of field samples received, or
      - Each 20 field samples within a case, or
      - Each 14 calendar day period during which field samples in a case are received.

5. **Analytical protocol required (attach copy if other than a protocol currently used in this program):**

   a. Follow the procedure outlined in EPA Method 160.1 for the analysis of samples for TDS. The contract required detection limit (CRDL) is 20.0 mg/L of dissolved solids.

   b. Store samples at 4°C until analysis and validation of results are completed.

c. Weigh solid residue to a constant weight, which is defined as two consecutive weight measurements differing by less than 0.5 mg, or less than 4%, whichever is smaller.

6. **Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):**

a. **Calibration Procedure and Criteria**:

Not Applicable.

b. **Internal Quality Control Checks, Control Limits and Corrective Actions**:

1. Check the analytical balance with standard weights of 100 mg, 1 g, and 100 g prior to any sample measurement. The difference between the measured weight and the standard weight must be less than 0.5 mg.

2. Analyze 1 set (2 concentration levels) of QC mineral reference samples at a frequency of one set per sample delivery group. The lower concentration level should be at the CRDL. Recoveries of 85-115% are required.

   If above control limits are exceeded, the source of the problem must be investigated and appropriate corrective measures must be taken and documented before further sample analysis proceeds. All samples processed with a QC reference sample that is out of control must be reanalyzed at no additional cost to the Region.

3. Analyze laboratory blanks (100 mL of reagent water) at a frequency of one per sample delivery group. Laboratory blanks must contain less than 20.0 mg/L of TDS.

   If the laboratory blank exceeds this criterion, the source of the contamination must be investigated and appropriate corrective measures must be taken and documented before further sample analysis proceeds. All samples processed with a laboratory blank that is out of control must be reanalyzed at no additional cost to the Region.

4. Use sample aliquots of 100 mL. If the residue in a sample is greater than 200 mg, repeat the analysis using a smaller sample aliquot.

5. Analyze sample duplicates at a frequency of one per sample delivery group. For the duplicate analysis to be in control, the relative percent difference (RPD) between the duplicate sample results must be less than or equal to 20% for concentrations greater than or equal to 100 mg/L, and the absolute difference between the duplicate sample results must be less than the CRDL for concentrations less than 100 mg/L. Flag all associated sample results on Forms 1 and 6 with an asterisk (*) if the duplicate analysis for the analyte is out of control.

6. The QC requirements listed above are the minimum required. It is impossible to address all analytical situations that might be experienced by a laboratory during the analysis of environmental samples. The laboratory is expected to adhere to good laboratory practices when analyzing samples. Notify the Region IMMEDIATELY if questions not addressed in this

document arise concerning the analysis of samples. The Laboratory Manager, or designee, must address any problems and resolutions in the SDG narrative.

7. **Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of-Custody documentation, etc.) If not completed, format of results will be left to program discretion.**

a. **Data Calculations and Reporting Units**:

1. For calculating field and QC sample results:

TDS, mg/L = (A - B) x 1,000 ÷ C

where:
A = weight of dried residue + dish in milligrams (mg)
B = weight of dish in mg
C = volume of sample used in milliliters (mL)

2. Sample results are to be reported in the concentration unit of milligram per liter (mg/L) of dissolved solids. The concentration result shall be reported to two significant figures if the result is less than 10 mg/L; and to three significant figures if the result is greater than or equal to 10 mg/L.

3. For rounding results, adhere to the following rules:

a) If the number following those to be retained is less than 5, round down;
b) If the number following those to be retained is greater than 5, round up; or
c) If the number following the last digit to be retained is equal to 5, round down if the digit is even, or round up if the digit is odd.

4. All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example of the calculations in the data package.

b. **Documentation and Deliverables**:

All documentation and deliverables required in Exhibit B of the Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganics Analysis OLM03.0 or OLM04.0 must be submitted. Deliverables (in the form of a purge file - i.e., original documents) for each SDG shall include the following items:

1. All original shipping documents and sample tracking reports, including signed chain-of-custody forms, airbills, and traffic reports.

2. A completed and signed document inventory form on a modified Inorganics Complete SDG File (CSF) Inventory Sheet (CLP Form DC-2).

3. All original sample receiving documents, including sample log-in information (CLP Form DC-1), an SDG cover sheet, and any other sample receipt forms.

4. A copy of the RAP CRF, as provided by the Region (so that any additions or revisions authorized by the Region will be

known). Only the technical portion of the CRF is required.

5. Any telephone logs referring to the samples.

6. A Cover Page, signed by the laboratory manager or designee, certifying the accuracy and validity of all data reported. The cover page must contain the following information: laboratory name; laboratory code; contract number; case/RAP number; SDG number; EPA sample numbers of all samples in the SDG; laboratory sample identification (ID) numbers, and the definition of any laboratory qualifiers used to flag the data.

7. A Case Narrative, describing any administrative or technical problems encountered such as QC, sample shipment, or analytical problems, and the resolution of these problems. A formula including definitions showing how the results were calculated, with an example calculation of an actual sample result.

8. Include the following information in the header for each data reporting form: laboratory name; contract number; laboratory code; case/RAP number; SDG number; and concentration units.

9. Tabulated field sample results for all field and QC samples on a modified CLP Form 1. Include the following additional information in the header: field sample ID, laboratory sample ID, matrix, level, and date received. Clearly specify the laboratory qualifiers.

10. Blank data on a modified CLP Form 3 with any laboratory qualifiers.

11. Duplicate results on a modified CLP Form 6 with the sample concentration, duplicate concentration, control limits, calculated relative percent difference (RPD), and laboratory qualifier (if applicable).

12. QC reference sample results on a modified CLP Form 7 with true values, found values, percent recoveries (%R), QC limits, and any laboratory qualifier (if applicable).

13. Instrument detection limit (IDL) and CRDL information on a modified CLP Form 10. Include in the header the date of IDL determination.

14. Analysis run logs on a modified CLP Form 14 with the time of analysis for each EPA sample number. Include the following additional information in the header: method number and start and end date of the sequence.

15. Raw data for sample and QC, including:

    a) analytical balance check data
    b) bench sheets and worksheets
    c) tabulated results

16. Bench sheets for sample preparation and the QC mineral reference standard, including the spiking solution identification with volumes and amounts added.

17. Standard preparation logs, for all standards used for spiking including the source, traceable lot number, date of

preparation, and concentrations of all analytes.

8. **Other (use additional sheets or attach supplementary information, as needed):**

If a copy of the "U.S. EPA Region 9 Laboratory QC Summary Report" form is attached, complete the form by following the directions on the first page of the form.

U. S. ENVIRONMENTAL PROTECTION AGENCY REGION 9
Environmental Services Branch

75 Hawthorne Street
San Francisco, CA 94105
Phone: 415/744-1498

SITE NAME: Grey Eagle Mine
CASE/RAP No.:

REGIONAL ANALYTICAL PROGRAM CLIENT REQUEST FORM

The analysis of water for the inorganic anion sulfate by EPA Method 300.0 (Revision 2.1, August 1993).

1. **Definition and number of work units involved (specify whether whole samples or fraction; specify sample matrices and concentration levels):**

   Twenty (20) whole surface water samples of low concentration.

2. **Estimated date(s) of collection (provide a sampling schedule):**

   October 13 through 15, 1999

3. **Estimated date(s) and method of shipment:**

   Overnight courier - samples are to be shipped on the day of collection for next day delivery including Saturday deliveries. Laboratory must be capable of accepting Saturday deliveries.

4. **Number of days analysis and data required after laboratory receipt of samples:**

   a. The contract required analysis holding time for nitrate-N, nitrite-N, and ortho-phosphate-P is 24 hours from the time of sample receipt by the laboratory. The contract required analysis holding time for bromide, chloride, fluoride, and sulfate is 25 days from the date of sample receipt by the laboratory.

   b. The technical analysis holding time for nitrate-N, nitrite-N, and ortho-phosphate-P is 48 hours from the time of sample collection. The technical analysis holding time for bromide, chloride, fluoride, and sulfate is 28 days from the date of sample collection.

   c. Data packages and all other deliverables are required within 35 days from receipt of last sample in each sample delivery group (SDG). A SDG is defined as the following, whichever is most frequent:

      - Each case of field samples received; or
      - Each 20 field samples within a case; or
      - Each 14 calendar day period during which field samples in a case are received.

5. **Analytical protocol required (attach copy if other than a protocol currently used in this program):**

   a. Follow the procedure outlined in EPA Method 300.0 (Revision 2.1, August 1993) for the analysis of anions in water. The contract required detection limits (CRDL) are provided in Section 8.

   b. Store samples at 4°C until analysis and validation of results are completed.

   c. Perform initial sample analysis on undiluted samples.

   d. Perform confirmatory techniques, such as sample dilution and spiking, when the identification of a peak in the chromatogram is questionable. Spike the sample with an appropriate amount of the relevant standard and reanalyze.

   e. Analyze a laboratory blank after the analysis of an unusually concentrated sample to check for contamination by carry-over. Any sample with anions present at a concentration 2× the calibration range is considered an unusually concentrated sample.

   f. If sample dilution is required to remove an interfering peak, and the resulting detection limit exceeds the maximum contaminant level (MCL), analyze the sample(s) by an alternate method, such as a colorimetric method, for which such interference does not present a problem. This problem may be of particular concern for nitrate-N or nitrite-N analyses since the MCLs for these analytes are 10 mg/L and 1 mg/L, respectively.

6. **Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):**

   a. **Calibration Procedure and Criteria**:

      1. Perform instrument calibration according to Section 10 of EPA Method 300.0 (Revision 2.1, August 1993).

         a. Prepare working standards daily from the stock solutions. Store stock standards at 4°C and replace after one month.

         b. Use a calibration blank and at least three calibration standards to obtain a standard calibration curve for each analyte. The low level standard should be at a concentration equal to or above the CRDL, but no more than 2×CRDL. The correlation coefficient of the calibration curve must be 0.995 or greater. Report the retention time window for each analyte; the retention time window is ±10% of the mean retention time for each analyte in the calibration standards.

      2. Analyze an initial calibration verification (ICV) standard at the mid-point concentration at the beginning of each working day and whenever the anion eluent is changed. ICV standard recoveries of 90-110% of the true values are required. The retention times for all ICV standards must fall within the retention time windows established in the initial calibration curve.

      3. Analyze an Instrument Performance Check (IPC) solution

following the ICV standard and prior to sample analysis, after every 10 or fewer samples, and at the end of the analyses. The IPC standard solution should contain all target analytes at a concentration different from the concentration of these analytes in the ICV standard. IPC standard recoveries of 90-110% of the true values are required. The retention times for all IPC standards must fall within the retention time windows established in the initial calibration curve.

4. Analyze an initial calibration blank (ICB) immediately following the ICV at the beginning of each analytical run. Analyze continuing calibration blanks (CCBs) immediately following every IPC, this includes prior to sample analysis, after every 10 or fewer samples, and at the end of the analytical sequence. Anion concentrations in the ICB and CCB should not exceed the CRDL. If this criterion is exceeded, terminate the analysis, correct the problem, recalibrate the instrument, verify the calibration, and reanalyze all analytical samples analyzed since the last compliant blank. Prepare ICB, CCB, and laboratory reagent with deionized water; these blanks are differentiated only by their order in the analytical sequence.

5. Analyze a contract required detection limit (CRDL) verification standard on each day that sample analyses are performed following the ICV standard and ICB but before samples. CRDL standard recoveries of 80-120% of the true values are required.

b. **Internal Quality Control Checks, Control Limits and Corrective Actions**:

1. When calibration verification standard measurements exceed the QC requirements for the ICV and IPC, the analysis must be terminated, the problem corrected, the instrument recalibrated, and the calibration reverified.

   The calibration verification standard reflects the conditions under which the analysis of all samples was performed. Associated samples are considered to be both the samples following the calibration verification and the preceding samples up to the previous calibration verification. Reanalyze all samples associated with an out-of-control calibration verification standard.

2. Analyze laboratory reagent blanks (LRBs) at a frequency of one per SDG, or on each day samples from the SDG are analyzed, whichever is more frequent. The concentration of anions in LRBs should not exceed the CRDL. If the concentration of any ion in the LRB exceeds the CRDL but the lowest concentration of the anion in the associated samples is greater than or equal to 10× the blank concentration, no action is required. If the anion concentration in the blank exceeds the CRDL and the concentration of anion in the associated samples is less than 10× the blank concentration, all associated samples with concentrations greater than the CRDL and less than 10× the blank concentration must be prepared again with another LRB and reanalyzed.

   If the blank exceeds these criteria, the laboratory must

consider the analytical system to be out of control. The source of the contamination must be investigated and appropriate corrective measures must be taken and documented before further sample analysis proceeds. All samples processed with a method blank that is out of control must be reanalyzed at no additional cost to the Region.

3. Analyze a laboratory fortified blank (LFB) at a frequency of one per SDG. Prepare the LFB using an aliquot of the QCS, which must be from a source different from that used for the calibration standards. Recoveries of 90-110% of the true values are required.

   If above control limits are exceeded, the source of the problem must be investigated and appropriate corrective measures must be taken and documented before further sample analysis proceeds. All samples processed with an LFB that is out of control must be reanalyzed at no additional cost to the Region.

4. Analyze a laboratory fortified matrix (LFM) sample at the frequency of one per sample delivery group. LFM samples are to be spiked at the concentration of the midpoint standard of the calibration curve using the QCS. Recoveries of 75-125% are required. If the LFM sample exceeds the calibration range, the sample must be diluted appropriately, re-spiked, and reanalyzed. Flag all associated sample results on Forms 1 and 5 with the qualifier "N" when the matrix spike analysis is out of control.

   An exception to this rule is granted in situations where the sample concentration exceeds the spike concentration by a factor of 4. In such an event, the data shall be reported unflagged.

5. Analyze a laboratory duplicate at the frequency of one per sample delivery group. The relative percent difference (RPD) between duplicate sample results should not exceed 20% for sample results greater than or equal to 5×CRDL. A control limit of ±CRDL should be applied for sample results that are less than 5×CRDL. Flag all associated sample results on Forms 1 and 6 with an asterisk (*) if the duplicate analysis for the analyte is out of control.

6. Dilute and reanalyze samples with anion concentrations exceeding the range of the calibration curve according to the dilution instructions in sections 10.2 and 10.5 of EPA Method 300.0 (Revision 2.1, August 1993). Results for such reanalyses should fall within the mid-range of the calibration curve. Submit documentation for both analyses.

7. The QC requirements listed above are the minimum required. It is impossible to address all analytical situations that might be experienced by a laboratory during the analysis of environmental samples. The laboratory is expected to adhere to good laboratory practices when analyzing samples. Notify the Region IMMEDIATELY if questions not addressed in this document arise concerning the analysis of samples. The Laboratory Manager, or designee, must address any problems and resolutions in the SDG narrative.

7. **Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of-Custody documentation, etc.) If not completed, format of results will be left to program discretion.**

a. Data Calculations and Reporting Units:

1. Calculate the sample results according to Section 12 of EPA Method 300.0 (Revision 2.1, August 1993). Report sample results in the concentration unit of milligram per liter (mg/L). Report anion concentrations which are ≥10 mg/L to three significant figures and anion concentrations which are <10 mg/L to two significant figures.

2. For rounding results, adhere to the following rules:

a) If the number following those to be retained is less than 5, round down;
b) If the number following those to be retained is greater than 5, round up; or
c) If the number following the last digit to be retained is equal to 5, round down if the digit is even, and round up if the digit is odd.

3. All records of analysis, dilutions and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example of the calculations in the data package.

b. **Documentation and Deliverables**:

All documentation and deliverables required in Exhibit B of the Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganics Analysis OLM03.0 or OLM04.0 must be submitted. Deliverables (in the form of a purge file - i.e., original documents) for each SDG shall include the following items:

1. All original shipping documents and sample tracking reports, including signed chain-of-custody forms, airbills, and traffic reports.

2. A completed and signed document inventory form on a modified Inorganics Complete SDG File (CSF) Inventory Sheet (CLP Form DC-2).

3. All original sample receiving documents, including sample log-in information (CLP Form DC-1), an SDG cover sheet, and any other sample receipt forms.

4. A copy of the RAP CRF, as provided by the Region (so that any additions or revisions authorized by the Region will be known). Only the technical portion of the CRF is required.

5. Any telephone logs referring to the samples.

6. A Cover Page, signed by the laboratory manager or designee, certifying the accuracy and validity of all data reported. The cover page must contain the following information: laboratory name; laboratory code; contract number; case/RAP number; SDG number; EPA sample numbers of all samples in the SDG; laboratory sample identification (ID) numbers, and the definition of any laboratory qualifiers used to flag the data.

7. A Case Narrative, describing any administrative or technical problems encountered such as QC, sample shipment, or analytical problems, and the resolution of these problems. A formula including definitions showing how the results were calculated, with an example calculation of an actual sample result.

8. Include the following information in the header for each data reporting form: laboratory name; contract number; laboratory code; case/RAP number; SDG number; and concentration units.

9. Tabulated field sample results for all field and QC samples on a modified CLP Form 1. Include the following additional information in the header: field sample ID, laboratory sample ID, matrix, level, and date received. Clearly specify the laboratory qualifiers.

10. Initial and continuing calibration verifications (ICV and IPC) on a modified CLP Form 2A with true values, found values, calculated percent recovery (%R), and QC limits. Include in the header the standard source.

11. CRDL standard result summary on a modified CLP Form 2B with true values, found values, calculated percent recovery (%R), QC limits, and any laboratory qualifiers. Include in the header the standard source.

12. Blank data (ICB, CCB and LRB) on a modified CLP Form 3 with any laboratory qualifiers.

13. Laboratory fortified matrix (LFM) sample result summary on a modified CLP Form 5 with the spiked sample (MS) concentration, sample concentration, spike added, control limits, calculated percent recovery (%R), and laboratory qualifier (if applicable).

14. Duplicate results on a modified CLP Form 6 with the sample concentration, duplicate concentration, control limits, calculated relative percent difference (RPD), and laboratory qualifier (if applicable).

15. Laboratory Fortified Blank (LFB) results on a modified CLP Form 7 with the true values, found values, and calculated percent recoveries (%R) to the nearest whole percentage point. Include the QC limits and any laboratory qualifiers (if applicable).

16. Instrument detection limit (IDL) and CRDL information on a modified CLP Form 10. Include in the header the instrument ID and date of IDL determination.

17. Analysis run logs on a modified CLP Form 14 with retention time window results from appropriate initial calibration, as well as the time of analysis for each EPA sample number. Include the following additional information in the header: instrument ID, method number, and start and end date of the sequence.

18. Raw sample, standard and QC data, including:

    a) instrument output
    b) bench sheets and worksheets
    c) tabulated results
    d) correlation coefficients

19. Standard preparation logs, for all standards used for calibration, spiking and LFB, which include source, traceable lot number, date of preparation, and concentrations of all analytes.

20. Any internal laboratory sample or sample extract transfer records and tracking sheets.

8. **Data Requirements**

The required target analytes with corresponding CRDLs are provided below.

Parameter	Water (mg/L)
Bromide	1.0
Chloride	1.0
Fluoride	0.10
Nitrate-N	0.10
Nitrite-N	0.10
ortho-Phosphate-P	1.0
Sulfate	1.0

9. **Other (use additional sheets or attach supplementary information, as needed):**

If a copy of the "U.S. EPA Region 9 Laboratory QC Summary Report" form is attached, complete the form by following the directions on the first page of the form.

U. S. ENVIRONMENTAL PROTECTION AGENCY REGION 9
Environmental Services Branch
75 Hawthorne Street, San Francisco, CA 94105
Phone: 415/744-1499

RAP Number

Modified? ___ YES ___ NO

REGIONAL ANALYTICAL PROGRAM

Client Request

_____ **Regional Transmittal** _____ **Telephone Request**

A. Region Contact: RSCC Coordinator, ESAT, (415) 882-3069

B. Date of Request: October 5, 1999

C. Site Name: Grey Eagle Mine

D. City/State/ZIP Code: Happy Camp, California

E. 2 Digit Superfund Site Identifier:

F. CERCLIS #:

Please provide below a description of your request for the Regional Analytical Program. In order to most efficiently obtain laboratory capability for your request, please address all applicable questions. Incomplete or erroneous information may result in a delay in the processing of your request. If you need to provide additional information not addressed by the questions, please attach additional sheets of paper.

1. **General description of analytical service requested:**

   The analysis of low concentration water for sulfide following the EPA Method 376.1 protocol.

2. **Definition and number of work units involved (specify whether whole samples or fraction; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium or high concentration):**

   Twenty (20) whole surface water samples of unknown concentration

3. **Purpose of analysis (specify whether Superfund [enforcement or remedial action], RCRA, NPDES, etc.):**

   Superfund preliminary assessment/site inspection

4. **Estimated date(s) of collection (provide a sampling schedule):**

   October 13 through 15, 1999

5. **Estimated date(s) and method of shipment:**

   Overnight courier - samples are to be shipped on the day of collection for next day delivery.

6. **Number of days analysis and data required after laboratory receipt of samples:**

   a. The contract required analysis holding time is 5 days from the date of sample receipt by the laboratory. The technical analysis holding time is 7 days from the date of sample collection.

   b. Data packages and all other deliverables are required within 35 days from receipt of last sample in each Sample Delivery Group (SDG). A SDG is defined as all samples received within a 14 day period or 20 samples, whichever is reached first.

7. **Analytical protocol required (attach copy if other than a protocol currently used in this program):**

   a. Follow EPA Method 376.1 (titrimetric, iodine) protocols for the analysis of sulfide. The contract required detection limit (CRDL) is 1.0 mg/L of sulfide. If a lower detection limit is necessary, the colorimetric method (EPA Method 376.2) must be used.

   b. Samples will be collected in the field without any headspace and in duplicates to allow for any re-analysis and laboratory duplicate analysis. Sample volumes will be 500 mL or larger.

   c. Samples will be preserved in the field by adding 2N zinc acetate at concentration of 1.5 mL/L and add enough 6N NaOH to pH between 9 and 11. Because of the preservation procedure, the entire sample must be used for analysis. The volume of sample used for analysis must be accurately known and must be included in the calculation of sample results.

   d. Store samples at 4°C until analysis and validation of results are completed.

8. **Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):**

   a. **Calibration Procedure and Criteria**: Not applicable.

   b. **Internal Quality Control Checks, Control Limits and Corrective Actions**:

      1. Prepare and standardize the following solutions daily:

         a) Iodine standard, according to EPA Method 376.1, Section 5.2.

         b) Sodium thiosulfate solution, according to Standard Methods 421 B, Sections 2e and 2f (16th Edition). Prepare fresh potassium bi-iodate standard solution each day according to Standard Methods 421 B, Section 2f (16th Edition).

      2. Perform all standardization titrations in duplicate. Duplicate results for solution standardization must agree to within 0.2 mL. Use the average of the duplicate results for calculations.

      3. Analyze titration blanks at a frequency of one per sample delivery group. The concentration of sulfide in titration

blanks must not exceed 1.0 mg/L.

4. Analyze laboratory duplicates at a frequency of one per sample delivery group. The relative percent difference (RPD) between duplicate sample results must be less than ±20% for concentrations exceeding 3 mg/L and less than 0.3 mg/L for concentrations below 3 mg/L.

5. If above control limits are exceeded, take appropriate actions to correct the problems and reanalyze the affected samples.

9. **Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of-Custody documentation, etc.) If not completed, format of results will be left to program discretion.**

a. **Data Calculations and Reporting Units**:

Calculate the sample results according to section 7 of EPA Method 376.1. Sample results are to be reported to the nearest 0.1 mg/L (above 1 mg/L) or to .2 significant figures above 10 mg/L. All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example of the calculations in the data package.

b. **Documentation and Deliverables**:

Deliverables (in the form of a purge file - i.e., original documents) for each Sample Delivery Group shall include all deliverables required by the IFB, including, but not limited to:

1. All Sample Tracking Reports (i.e., signed RAP Packing Lists/Chain-of-Custody forms).

2. Sample log-in information on CLP Form DC-1.

3. Complete SDG File (CSF) inventory on a modified CLP Form DC-2.

4. A copy of the RAP Client Request Form (CRF), as provided by the Region (so that any revisions or additions authorized by the Region will be known). Only the technical portion of the RAP CRF is required.

5. Any telephone logs referring to the samples.

6. A Case Narrative, signed by the laboratory manager or his or her designee, certifying the accuracy and validity of all data reported and describing any problems encountered during the analyses and documenting their resolution(s).

7. Tabulated sample results on a modified CLP Form I, with units.

8. Blank data on a modified CLP Form III.

9. Duplicate results on a modified CLP Form VI with calculated relative percent difference (RPD) values.

10. Analysis run logs on a modified CLP Forms XIV.

11. Raw sample, standard and QC data, including:

    a. instrument output
    b. bench sheets and worksheets
    c. tabulated results

12. Bench sheets for sample preparation.

13. Standard preparation logs, including traceable lot numbers, for all standards used for calibration and spiking.

10. **Other (use additional sheets or attach supplementary information, as needed):**

Attached is a copy of the "U. S. EPA Region 9 Laboratory QC Summary Report" form. This form is to be completed by the Laboratory Manager or his/her designee and submitted with each data package. The form is to reflect the conditions contained within the data package with which it is submitted. Laboratories may make additional copies of this form as needed.

11. **Name of sampling/shipping contact:** Tim Colen

Phone: (415) 981 - 2811

12. **Data Requirements:**

Parameter	Contract Required Detection Limit (CRDL)
Sulfide	1.0 mg/L

13. **QC Requirements:**

QC Required	Frequency of QC	Limits (% or Conc.)
Laboratory blank	1 per SDG	≤CRDL
Laboratory duplicate	1 per SDG	RPD ≤20%

14. **Action required if limits are exceeded:**

If above control limits are exceeded, take appropriate actions to identify the problem by reanalyzing the affected samples. Corrective action should be taken before additional samples are analyzed.

C Health and Safety Plan

ecology and environment, inc.

EXISTING SITE SAFETY PLAN ADDENDUM FORM

09-9902-0022

Site Name: Grey Eagle Mine Site TDD/Pan/Project Number: 0402-GEST-XX

Date of original SSP: 04-11-96

Date of amendment: 09-30-99

Date of proposed new work: 10-13 to 15-99

Added activities and hazard evaluations: START will collect about 20 co-located sediment and surface water samples along a ≈6mi stretch of Indian Creek, a tributary of the Klamath. Hazards include sunburn, poisonous plants, trip-fall into the river.

Added monitoring activities: None

Level of protection: ___ A ___ B ___ C X D

Reason for up/downgrading: None anticipated

PPE: Nitrile gloves for collection of samples

Decon: None

Team Members	Responsibility
Tim Colen	Proj Mgr
Ben Castellana	H+S Officer

Equipment	Quantity	Equipment	Quantity
None			

THE TERMS OF THE ORIGINAL SSP SHALL BE IN EFFECT EXCEPT AS NOTED ON THIS FORM.

Prepared by: T Colen Date: 9-30-99

Reviewed by: Mcleod Date: 9/30/99

INSTRUCTIONS: This form to be approved through normal channels and attached to original plan. Form SSP-A

>/>/ssp

ecology and environment, inc.

EXISTING SITE SAFETY PLAN ADDENDUM FORM

Site Name: Grey Eagle Mine Site TDD/Pan/Project Number: 09/9809-0004 0334-GESF-XX

Date of original SSP: 04-11-96

Date of amendment: 08-13-98

Date of proposed new work: Aug 19-20, 1998

Added activities and hazard evaluations: Mineralogical inspection of washed tailings taken from an on-site waste pile. Most significant hazards include heat stress, poisonous plants, and sunburn.

Added monitoring activities: None

Level of protection: ____ A ____ B ____ C X D

Reason for up/downgrading:

PPE: Latex gloves for handling tailings

Decon: N/A

Team Members	Responsibility
Tim Colen	Proj Mgr
Ben Castellano	Proj Geologist/H+S officer

Equipment	Quantity	Equipment	Quantity
YSI Water Quality Meter	1		

THE TERMS OF THE ORIGINAL SSP SHALL BE IN EFFECT EXCEPT AS NOTED ON THIS FORM.

Prepared by: Tim Colen Date: 8-13-98

Reviewed by: CMcleod Date: 8/18/98

INSTRUCTIONS: This form to be approved through normal channels and attached to original plan. Form SSP-A

>/>/ssp

ecology and environment, inc.

SITE SPECIFIC
HEALTH AND SAFETY PLAN

Project: GREY EAGLE MINE SITE

Project No: KJ 9100

TDD/PAN No: 09-9603-0001 | 0029-9ESA-XX

Project Location: HAPPY CAMP, SISKIYOU

Proposed Date of Field Activities: 04/17/96 — 04/18/96

Project Director: THOMPSON CHAMBERS

Project Manager: JAY GUEVARRA

Prepared by: JAY GUEVARRA Date Prepared: 04/11/96

Approved by: [signature] Date Approved: 04/15/96

For AGS, INC.

Approved by: [signature] Date Approved: 4/15/96

Position: MANAGER ENVIRONMENTAL DIVISION

1. INTRODUCTION

1.1 POLICY

It is E & E's policy to ensure the health and safety of its employees, the public, and the environment during the performance of work it conducts. This site-specific health and safety plan (SHASP) establishes the procedures and requirements to ensure the health and safety of E & E employees for the above-named project. E & E's overall safety and health program is described in *Corporate Health and Safety Program for Toxic and Hazardous Substances* (CHSP). After reading this plan, applicable E & E employees shall read and sign E & E's Site-Specific Health and Safety Plan Acceptance form.

This SHASP has been developed for the sole use of E & E employees and is not intended for use by firms not participating in E & E's training and health and safety programs. Subcontractors are responsible for developing and providing their own safety plans.

This SHASP has been prepared to meet the following applicable regulatory requirements and guidance:

Applicable Regulation/Guidance
29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER)
Other:

1.2 SCOPE OF WORK

Description of Work: PERFORM SITE ASSESSMENT TO EVALUATE IMPACT OF MILL TAILINGS ON NEARBY STREAMS. RUN-OFF, INDIAN CREEK AND SOIL SAMPLES WILL BE COLLECTED. XRF AND CYANIDE ANALYSES WILL BE CARRIED OUT, WITH ANALYTICAL CONFIRMATION.

Equipment/Supplies: Attachment 1 contains a checklist of equipment and supplies that will be needed for this work.

The following is a description of each numbered task:

Task Number	Task Description
1	COLLECTION OF RUN-OFF AND CREEK SAMPLES (sediment)
2	COLLECTION OF SOIL SAMPLES USING HAND AUGER/trowel

1.3 SITE DESCRIPTION

Site Map: A site map or sketch is attached at the end of this plan.

Site History/Description (see project work plan for detailed description): THE TAILINGS FROM A FORMER COPPER MINE HAVE BEEN STORED NEARBY INDIAN CREEK. A COLORED LEACHATE HAS BEEN OBSERVED RUNNING INTO THE CREEK.

Is the site currently in operation? ☐ Yes ☒ No

Locations of Contaminants/Wastes: see Figure 1

Types and Characteristics of Contaminants/Wastes:

☒ Liquid	☒ Solid	☐ Sludge	☒ Gas/Vapor (DUST)
☐ Flammable/Ignitable	☐ Volatile	☒ Corrosive	☐ Acutely Toxic
☐ Explosive	☐ Reactive	☐ Carcinogenic	☐ Radioactive
☐ Medical/Pathogenic	Other:		

2. ORGANIZATION AND RESPONSIBILITIES

E & E team personnel shall have on-site responsibilities as described in E & E's standard operating procedure (SOP) for Site Inspection. The project team, including qualified alternates, is identified below.

Name	Site Role/Responsibility
JAY GUEVARRA	Project/Task Manager
JIM JAMES	Site Safety Officer
KAREN MAHONY, (AGS, INC.)	Project Chemist

3. TRAINING

Prior to work, E & E team personnel shall have received training as indicated below. As applicable, personnel shall have read the project work plan, sampling and analysis plan, and/or quality assurance project plan prior to project work.

Training	Required
40-Hour OSHA HAZWOPER Initial Training and Annual Refresher (29 CFR 1910.120)	X
Annual First Aid/CPR	X
Hazard Communication (29 CFR 1910.1200)	X
40-Hour Radiation Protection Procedures and Investigative Methods	

Training	Required
8-Hour General Radiation Health and Safety	
Radiation Refresher	
DOT and Biannual Refresher	
Other:	

4. MEDICAL SURVEILLANCE

4.1 MEDICAL SURVEILLANCE PROGRAM

E & E field personnel shall actively participate in E & E's medical surveillance program as described in the CHSP and shall have received, within the past year, an appropriate physical examination and health rating.

E & E's health and safety record (HSR) form will be maintained on site by each E & E employee for the duration of his or her work. E & E employees should inform the site safety officer (SSO) of any allergies, medical conditions, or similar situations that are relevant to the safe conduct of the work to which this SHASP applies.

4.2 RADIATION EXPOSURE

4.2.1 External Dosimetry

Thermoluminescent Dosimeter (TLD) Badges: TLD badges are required to be worn by all E & E field personnel on all E & E sites.

Pocket Dosimeters: ——

Other: ——

4.2.2 Internal Dosimetry

☐ Whole body count ☐ Bioassay ☐ Other

Requirements: ——

4.2.3 Radiation Dose

Dose Limits: E & E's radiation dose limits are stated in the CHSP. Implementation of these dose limits may be designated on a site-specific basis.

Site-Specific Dose Limits: ——

ALARA Policy: Radiation doses to E & E personnel shall be maintained as low as reasonably achievable (ALARA), taking into account the work objective, state of technology available, economics of improvements in dose reduction with respect to overall health and safety, and other societal and socioeconomic considerations.

5. SITE CONTROL

5.1 SITE LAYOUT AND WORK ZONES

Site Work Zones: Refer to the map or site sketch, attached at the end of this plan, for designated work zones. (Figure 2)

Site Access Requirements and Special Considerations: _____

Illumination Requirements: NONE - ALL WORK WILL BE CARRIED OUT DURING DAYLIGHT HOURS

Sanitary Facilities (e.g., toilet, shower, potable water): BOTTLED WATER WILL BE PROVIDED

On-Site Communications: CELL PHONE WILL BE AVAILABLE

Other Site-Control Requirements: _____

5.2 SAFE WORK PRACTICES

Daily Safety Meeting: A daily safety meeting will be conducted for all E & E personnel and documented on the Daily Safety Meeting Record form or in the field logbook. The information and data obtained from applicable site characterization and analysis will be addressed in the safety meetings and also used to update this SHASP, as necessary.

Work Limitations: Work shall be limited to a maximum of 12 hours per day. If 12 consecutive days are worked, at least one day off shall be provided before work is resumed. Work will be conducted in daylight hours unless prior approval is obtained and the illumination requirements in 29 CFR 1910.120(m) are satisfied.

Weather Limitations: Work shall not be conducted during electrical storms. Work conducted in other inclement weather (e.g., rain, snow) will be approved by project management and the regional safety coordinator or designee.

Other Work Limitations: _____

Buddy System: Field work will be conducted in pairs of team members according to the buddy system.

Line of Sight: Each field team member shall remain in the line of sight and within verbal communication of at least one other team member.

Eating, Drinking, and Smoking: Eating, drinking, smoking, and the use of tobacco products shall be prohibited in the exclusion and contamination reduction areas, at a minimum, and shall only be permitted in designated areas.

Contamination Avoidance: Field personnel shall avoid unnecessary contamination of personnel, equipment, and materials to the extent practicable.

Sample Handling: Protective gloves of a type designated in Section 7 will be worn when containerized samples are handled for labeling, packaging, transportation, and other purposes.

Vermiculite Handling: Respiratory protection (i.e., high-efficiency particulate air filtration) is recommended when vermiculite is used to package samples into shipping containers (some vermiculite contains low concentrations of asbestos).

Other Safe Work Practices: _____

6. HAZARD EVALUATION AND CONTROL

6.1 PHYSICAL HAZARD EVALUATION AND CONTROL

Potential physical hazards and their applicable control measures are described in the following table for each task.

Hazard	Task Number	Hazard Control Measures
Biological (flora, fauna, etc.)	1 + 2	• Potential hazard: POISON OAK, TICKS • Establish site-specific procedures for working around identified hazards. • Other: _____
Cold Stress	1+2	• Provide warm break area and adequate breaks. • Provide warm noncaffeinated beverages. • Promote cold stress awareness. • See *Cold Stress Prevention and Treatment* (attached at the end of this plan if cold stress is a potential hazard).
Compressed Gas Cylinders	1+2	• Use caution when moving or storing cylinders. • A cylinder is a projectile hazard if it is damaged or its neck is broken. • Store cylinders upright and secure them by chains or other means. • Other: _____
Confined Space	—	• Ensure compliance with 29 CFR 1910.146. • See SOP for Confined Space Entry. Additional documentation is required. • Other: _____
Drilling	—	• See SOP for Health and Safety on Drilling Rig Operations. Additional documentation may be required. • Other: _____ • Other: _____
Drums and Containers	—	• Ensure compliance with 29 CFR 1910.120(j). • Consider unlabeled drums or containers to contain hazardous substances and handle accordingly until the contents are identified. • Inspect drums or containers and assure integrity prior to handling. • Move drums or containers only as necessary; use caution and warn nearby personnel of potential hazards. • Open, sample, and/or move drums or containers in accordance with established procedures; use approved drum/container-handling equipment. • Other: _____

Hazard	Task Number	Hazard Control Measures
Electrical	—	• Ensure compliance with 29 CFR 1910 Subparts J and S. • Locate and mark energized lines. • De-energize lines as necessary. • Ground all electrical circuits. • Guard or isolate temporary wiring to prevent accidental contact. • Evaluate potential areas of high moisture or standing water and define special electrical needs. • Other: _____
Excavation and Trenching	—	• Ensure that excavations comply with and personnel are informed of the requirements of 29 CFR 1926 Subpart P. • Ensure that any required sloping or shoring systems are approved as per 29 CFR 1926 Subpart P. • Identify special personal protective equipment (PPE) (see Section 7) and monitoring (see Section 8) needs if personnel are required to enter approved excavated areas or trenches. • Maintain line of sight between equipment operators and personnel in excavations/trenches. Such personnel are prohibited from working in close proximity to operating machinery. • Suspend or shut down operations at signs of cave in, excessive water, defective shoring, changing weather, or unacceptable monitoring results. • Other: _____ • Other: _____
Fire and Explosion	\	• Inform personnel of the location(s) of potential fire/explosion hazards. • Establish site-specific procedures for working around flammables. • Ensure that appropriate fire suppression equipment and systems are available and in good working order. • Define requirements for intrinsically safe equipment. • Identify special monitoring needs (see Section 8). • Remove ignition sources from flammable atmospheres. • Coordinate with local fire-fighting groups regarding potential fire/explosion situations. • Establish contingency plans and review daily with team members. • Other: _____
Heat Stress	1+2	• Provide cool break area and adequate breaks. • Provide cool noncaffeinated beverages. • Promote heat stress awareness. • Use active cooling devices (e.g., cooling vests) where specified. • See *Heat Stress Prevention and Treatment* (attached at the end of this plan if heat stress is a potential hazard).
Heavy Equipment Operation	—	• Define equipment routes, traffic patterns, and site-specific safety measures. • Ensure that operators are properly trained and equipment has been properly inspected and maintained. Verify back-up alarms. • Ensure that ground spotters are assigned and informed of proper hand signals and communication protocols. • Identify special PPE (Section 7) and monitoring (Section 8) needs.

Hazard	Task Number	Hazard Control Measures
		• Ensure that field personnel do not work in close proximity to operating equipment. • Ensure that lifting capacities, load limits, etc., are not exceeded. • Other: _____
Heights (Scaffolding, Ladders, etc.)	—	• Ensure compliance with applicable subparts of 29 CFR 1910. • Identify special PPE needs (e.g., lanyards, safety nets, etc.) • Other: _____
Noise	—	• Establish noise level standards for on-site equipment/operations. • Inform personnel of hearing protection requirements (Section 7). • Define site-specific requirements for noise monitoring (Section 8). • Other: _____
Overhead Obstructions	—	• Wear hard hat. • Other: _____
Power Tools	—	• Ensure compliance with 29 CFR 1910 Subpart P. • Other: _____
Sunburn	1 + 2	• Apply sunscreen. • Wear hats/caps and long sleeves. • Other: _____
Utility Lines	—	• Identify/locate existing utilities prior to work. • Ensure that overhead, underground, and nearby utility lines are at least 25 feet away from project activities. • Contact utilities to confirm locations, as necessary. • Other: _____
Weather Extremes	1 + 2	• Potential hazards: _____ • Establish site-specific contingencies for severe weather situations. • Provide for frequent weather broadcasts. • Weatherize safety gear, as necessary (e.g., ensure eye wash units cannot freeze, etc.). • Identify special PPE (Section 7) needs. • Discontinue work during severe weather. • Other: _____
Other: TRIP / FALL	1 + 2	• _____ • _____
Other: DROWNING	1	• _____ • _____

6.2 CHEMICAL HAZARD EVALUATION AND CONTROL

6.2.1 Chemical Hazard Evaluation

Potential chemical hazards are described by task number in Table 6-1. Hazard Evaluation Sheets for major known contaminants are attached at the end of this plan.

Table 6-1

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA) PEL	REL	TLV	Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID Relative Response	FID/PID Ioniz. Poten. (eV)
1+2	Hydrogen cyanide	10 ppm	Short term 4-7ppm	ceiling 4.7ppm	Y	inhalation, skin absorption ingestion, skin/eye contact	asphyxia, weakness, headache, confusion nausea	bitter almond		13.60
1+2	* Cadmium	0.005 mg/m³	lowest poss. conc.	0.002 mg/m³	N	inhalation, ingestion	tight chest, cough, pain headache, nausea	—		NA
1+2	Sb	0.5 mg/m³	0.5 mg/m³	0.5 mg/m³	Y	inhalation, ingestion, skin/eye contact	skin, eye, nose irritant; headache, nausea unable to smell properly	—		NA
1+2	* As	0.5 mg/m³	—	0.01 mg/m³	Y	inhalation, skin/eye contact, ingestion	respiratory distress, skin irritant, diarrhea muscle tremor	garlic		depends on compound.
1+2	* Be	0.002 ceiling 0.005 mg/m³	0.0005 mg/m³	0.002 mg/m³	Y	inhalation, skin/eye contact	chest pain, cough, clubbing fingers, eye irritation.	—		NA
1+2	Ba	0.5 mg/m³	0.5 mg/m³	0.5 mg/m³	Y	inhalation, ingestion skin/eye contact	irritant to eyes, skin respiratory system muscle spasm, gastroenteritis	—		?
1+2	* Cr	CrII 250 CrIII 25 Cr mg/m³	250 25 0.5 mg/m³	CrVI 0.01 0.5 0.5 mg/m³	Y	inhalation, ingestion skin/eye contact	irritant to eyes, dermititis	—		NA
1+2	* Co	0.1 mg/m³	0.05 mg/m³	0.02 mg/m³	Y	inhalation, ingestion skin/eye contact	coughing, decreased pulmonary function, wheezing	—		NA
1+2	* Pb	0.05 mg/m³	0.1 mg/m³	0.05 mg/m³	N	inhalation, ingestion skin/eye contact	weakness, insomnia, abdominal pain, facial pallor.	—		NA
1+2	Hg	ceiling 0.1 mg/m³ organo 0.01	0.05 organo 0.01	0.025 organo 0.01	Y	inhalation, absorption thro' skin, ingestion, skin/eye contact.	irritant eyes + skin cough, chest pain dizziness, nausea	—		NA

Note: Use an asterisk (*) to indicate known or suspected carcinogens.

Table 6-1 Continued

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA) PEL	REL	TLV	Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID Relative Response	FID/PID Ioniz. Poten. (eV)
1+2	Molybdenum	metal 15 mg/m³ sol. cpds 5 mg/m³	metal ? sol. cpds ?	metal 10 mg/m³ sol. cpds 5 mg/m³	N	inhalation, ingestion skin/eye contact	eye irritant, nose + throat irritant diarrhea	—		NA.
1+2	Ni *	1 mg/m³	0.015 mg/m³	0.1 mg/m³	Y	inhalation, ingestion skin/eye contact.	allergic asthma sensitization dermitis	—		NA
1+2	Se	0.2 mg/m³	0.2 mg/m³	0.2 mg/m³	Y	inhalation, ingestion skin/eye contact	eye, skin, nose throat headache, metallic taste garlic breath	—		NA
1+2	Ag	0.01 mg/m³	0.01 mg/m³	metal 0.1 sol.cpds 0.01	Y	inhalation, ingestion skin/eye contact	Blue-grey eyes, nasal septum, throat + skin irritant, skin ulceration	—		NA
1+2	Tl	0.1 mg/m³	0.1 mg/m³	0.1 mg/m³	Y	inhalation, absorption ingestion, skin/eye contact	nausea, diarrhea, abdominal pain, vomit chest pain	—		NA
1+2	V dust.	ceiling 0.5 mg/m³	ceiling 0.05 mg/m³	0.05 mg/m³	Y	Inhalation, ingestion contact skin/eye	Irritant to eyes, skin throat. Green tongue metallic taste, cough	—		NA
1+2	ZnO	5 mg/m³	5 mg/m³	5 mg/m³	N	Inhalation	metal fume fever, chills, nausea, dry throat cough, weakness	—		NA
1+2	Fe_2O_3	10 mg/m³	5 mg/m³	5 mg/m³	N	Inhalation	benign pneumoconiosis	—		NA

Note: Use an asterisk (*) to indicate known or suspected carcinogens.

6.2.2 Chemical Hazard Control

An appropriate combination of engineering/administrative controls, work practices, and PPE shall be used to reduce and maintain employee exposures to a level at or below published exposure levels (see Section 6.2.1).

Applicable Engineering/Administrative Control Measures: _____

_____

PPE: See Section 7. _____

6.3 RADIOLOGICAL HAZARD EVALUATION AND CONTROL

6.3.1 Radiological Hazard Evaluation

Potential radiological hazards are described below by task number. Hazard Evaluation Sheets for major known contaminants are attached at the end of this plan.

Task Number	Radionuclide	DAC (μCi/ml)	Route(s) of Exposure	Major Radiation(s)	Energy(s) (MeV)	Half-Life

6.3.2 Radiological Hazard Control

Engineering/administrative controls and work practices shall be instituted to reduce and maintain employee exposures to a level at or below the permissible exposure/dose limits (see sections 4.2.3 and 6.3.1). Whenever engineering/administrative controls and work practices are not feasible or effective, any reasonable combination of engineering/administrative controls, work practices, and PPE shall be used to reduce and maintain employee exposures to a level at or below permissible exposure/dose limits.

Applicable Engineering/Administrative Control Measures: _____

_____

PPE: See Section 7. _____

7. LEVEL OF PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT

7.1 LEVEL OF PROTECTION

The following levels of protection (LOPs) have been selected for each work task based on an evaluation of the potential or known hazards, the routes of potential hazard, and the performance specifications of the PPE. On-site monitoring results and other information obtained from on-site activities will be used to modify these LOPs and the PPE, as necessary, to ensure sufficient personnel protection. The authorized LOP and PPE shall only be changed with the approval of the regional safety coordinator or designee. Level A is not included below because Level A activities, which are performed infrequently, will require special planning and addenda to this SHASP.

Task Number	B	C	D	Modifications Allowed
1		X	(X)	Rubber boots → OUTER ↓ Saran t
2		X	(X)	

INNER

Note: Use "X" for initial levels of protection. Use "(X)" to indicate levels of protection that may be used as site conditions warrant.

7.2 PERSONAL PROTECTIVE EQUIPMENT

The PPE selected for each task is indicated below. E & E's PPE program complies with 29 CFR 1910.120 and 29 CFR 1910 Subpart I and is described in detail in the CHSP. Refer to 29 CFR 1910 for the minimum PPE required for each LOP.

PPE	Task Number/LOP					
	1	2				
Full-face APR						
PAPR						
Cartridges:						
H						
GMC-H						
GMA-H						
Other:						
Positive-pressure, full-face SCBA						
Spare air tanks (Grade D air)						
Positive-pressure, full-face, supplied-air system						
Cascade system (Grade D air)						
Manifold system						
5-Minute escape mask						
Safety glasses	X	X				
Monogoggles						
Coveralls/clothing	X	X				

PPE	Task Number/LOP					
	1	2				
Protective clothing:						
Tyvek						
Saranex	X	X				
Other:						
Splash apron						
Inner gloves:						
Cotton						
Nitrile	X	X				
Latex						
Other:						
Outer gloves:						
Viton						
Rubber	X	X				
Neoprene						
Nitrile						
Other:						
Work gloves	X	X				
Safety boots (as per ANSI Z41)	X	X				
Neoprene safety boots (as per ANSI Z41)	X					
Boot covers (type: _____)						
Hearing protection (type: _____)						
Hard hat	X	X				
Face shield						
Other:						
Other:						

8. HEALTH AND SAFETY MONITORING

Health and safety monitoring will be conducted to ensure proper selection of engineering/administrative controls, work practices, and/or PPE so that employees are not exposed to hazardous substances at levels that exceed permissible exposure/dose limits or published exposure levels. Health and safety monitoring will be conducted using the instruments, frequency, and action levels described in Table 8-1. Health and safety monitoring instruments shall have been appropriately calibrated and/or performance-checked prior to use.

GRAY EAGLE MINE SITE ASSESSMENT
XRF SURVEY

RATIONALE FOR RESPIRATORY PROTECTION ACTION LEVEL

Environmental Data

The highest sediment sample concentration for cadmium is 0.4 mg/l and for copper is 433 mg/l. There is no analytical data to show the metal concentrations in soil. However taking a worse case scenario, we are assuming a cadmium concentration at 1%.

Occupational Safety Levels

Relevant occupational safety levels are as follows:

Cd and inorgranic Cd compounds:	PEL:	0.005 mg/m(3)
	TLV:	0.002 mg/m(3)

Worker Protection Rationale

Protection for on-site personnel will be based on worst case scenarios and incorporates existing environmental data, relevant safety levels and significant safety margins. Therefore, because it requires the more stringent level of protection, the OSHA safety level figure will be used in calculations.

Worker exposure on-site will occur from contact with dust generated from the disruption of soils by sampling activities. We can therefore assume that the dust generated will have the same concentration of contaminants as the existing soil, a worst case value of 10,000 mg/m(3) (1%) at any given time. By the following equation (following the OSHA PEL of 0.005 mg/m(3), workers with no respiratory protection must not be exposed to dust conditions of over mg/m(3).

$$0.005/.01 = 0.5 \text{ mg/m(3) dust}$$

E & E Corporate safety policy recommends calculating an additional safety margin (see attached Safety Alert) by dividing the figure generated above in two:

$$0.5 \text{ mg/m(3)} \ / 2 = 0.25 \text{ mg/m(3)}$$

On-Site Protection

START will be in level D personal protection while on site. This will include a tyvek coverall and disposable boot covers for general protection from ambient dust. Continuous dust level monitoring will utilize a miniram dust meter and require upgrading to level C protection (Ultra-Twin APR with GMC-H cartridges) if dust levels exceed 0.25 mg/m(3).

Table 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels[a]	
☐ PID (e.g., HNu IS-101) ☐ FID (e.g., OVA 128-GC)					**Unknown Vapors** Background to 1 ppm: Level D *1 to 5 ppm above background:* Level C 5 to 500 ppm above background: Level B >500 ppm above background: Level A	**Contaminant-Specific**
Oxygen Meter/Explosimeter					**Oxygen** <19.5% or >25.0%: Evacuate area; eliminate ignition sources; reassess conditions. 19.5 to 25.0%: Continue work in accordance with action levels for other instruments.	**Explosivity** ≤10% LEL: Continue work in accordance with action levels for other instruments; monitor continuously for combustible atmospheres. >10% LEL: Evacuate area; eliminate ignition sources; reassess conditions.
Radiation Alert Monitor (Rad-mini or RAM-4)					<0.1 mR/hr: Continue work in accordance with action levels for other instruments. ≥0.1 mR/hr: Evacuate area; reassess work plan and contact radiation safety specialist.	
Mini-Ram Particulate Monitor	2	Metals	Tailings Pond	hourly	**General/Unknown** Evaluate health and safety measures when dust levels exceed 2.5 milligrams per cubic meter.	**Contaminant-Specific**
HCN/H_2S (Monitox)	1+2	Cyanide	Stream/Tailings Pond	During Sampling	≥4 ppm: Leave area and consult with SSO.	
Draeger Colorimetric Tubes	1+2	Cyanide	Stream/ Tailings POND	During Sampling	**Tube**: Hydrocyanic acid **Action Level**: 4.7 ppm **Action**: Leave site	

Table 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels[a]
Air Monitor/Sampler Type:_____ Sampling medium: _____					**Action Level** **Action**
Personal Sampling Pump Type:_____ Sampling medium: _____					**Action Level** **Action**
Micro R Meter					<2 mR/hr: Continue work in accordance with action levels for other instruments. 2 to 5 mR/hr: In conjunction with a radiation safety specialist, continue work and perform stay-time calculations to ensure compliance with dose limits and ALARA policy. >5 mR/hr: Evacuate area to reassess work plan and evaluate options to maintain personnel exposures ALARA and within dose limits.
Ion Chamber					See micro R meter action levels above.
Radiation Survey Ratemeter/Scaler with External Detector(s)					**Detector** **Action Level** **Action**
Noise Dosimeter (Sound Level Meter)					≤85 decibels as measured using the A-weighed network (dBa): Use hearing protection if exposure will be sustained throughout work shift. >85 dBA: Use hearing protection. >120 dBA: Leave area and consult with safety personnel.
Other:					
Other:					

[a] Unless stated otherwise, airborne contaminant concentrations are measured as a time-weighted average in the worker's breathing zone. Acceptable concentrations for known airborne contaminants will be determined based on OSHA/NIOSH/ACGIH and/or NRC exposure limits.

9. DECONTAMINATION PROCEDURES

All equipment, materials, and personnel will be evaluated for contamination upon leaving the exclusion area. Equipment and materials will be decontaminated and/or disposed and personnel will be decontaminated, as necessary. Decontamination will be performed in the contamination reduction area or any designated area such that the exposure of uncontaminated employees, equipment, and materials will be minimized. Specific procedures are described below.

Equipment/Material Decontamination Procedures (specified by work plan): see QASP

Ventilation: All decontamination procedures will be conducted in a well-ventilated area.

Personnel Decontamination Procedures: SITE PERSONNEL WILL REMOVE BOOTIES, GLOVES, COVERALLS, RESPIRATOR (IF APPLICABLE). RESPIRATORS WILL BE CLEANED AND SANITIZED AT THE END OF EACH DAY. PERSONNEL WILL WASH HANDS AND FACE WHEN LEAVING DECON ZON

PPE Requirements for Personnel Performing Decontamination: Saranex, boots, nitrile (inner), rubber (outer) gloves

Personnel Decontamination in General: Following appropriate decontamination procedures, all field personnel will wash their hands and face with soap and potable water. Personnel should shower at the end of each work shift.

Disposition of Disposable PPE: Disposable PPE must be rendered unusable and disposed as indicated in the work plan.

Disposition of Decontamination Wastes (e.g., dry wastes, decontamination fluids, etc.): local trash bin

10. EMERGENCY RESPONSE

This section contains additional information pertaining to on-site emergency response and does not duplicate pertinent emergency response information contained in earlier sections of this plan (e.g., site layout, monitoring equipment, etc.). Emergency response procedures will be rehearsed regularly, as applicable, during project activities.

10.1 EMERGENCY RESPONSIBILITIES

All Personnel: All personnel shall be alert to the possibility of an on-site emergency; report potential or actual emergency situations to the team leader and SSO; and notify appropriate emergency resources, as necessary.

Team Leader: The team leader will determine the emergency actions to be performed by E & E personnel and will direct these actions. The team leader also will ensure that applicable incidents are reported to appropriate E & E and client project personnel and government agencies.

SSO: The SSO will recommend health/safety and protective measures appropriate to the emergency.

Other: _____

_____

10.2 LOCAL AND SITE RESOURCES (including phone numbers)

Ambulance: 911 or 916 842 3515

Hospital: SISKIYOU GENERAL HOSPITAL, YREKA 916 842 4121

Directions to Hospital (map attached at the end of this plan): ~1½ hour drive. Take Hwy 96 heading East. Turn right onto Hwy 263 heading South, and continue to Yreka. Hospital is located on Hwy 263 on LHS of road just before Klamath Motor Lodge. (see attached map)

Poison Control: _____

Police Department: Sheriffs dept: 916 493 2338

Fire Department: 911 or 916 842 3515

Client Contact: _____

Site Contact: KAY LAWRENCE, OSC.

On-Site Telephone Number: —

Cellular Telephone Number: 415 518 3161

Radios Available: _____

Other: _____

10.3 E & E EMERGENCY CONTACTS

E & E Emergency Response Center (24 Hours):		716/684-8940
Corporate Health and Safety Director, Dr. Paul Jonmaire:		716/684-8060 (office) 716/655-1260 (home)
Regional Office Contact:	THOMPSON CHAMBERS	415 777 2811 x 203 (office) 415 282 0944 (home)
Other:	CYNTHIA JONES	415 777 2811 x 205 (office) 510 654 6250 (home)

10.4 MED-TOX HOTLINE

The Med-Tox hotline is activated and accessed as follows:

1. Call the Emergency Response Center 716/684-8940

10.5 AGS - SUBCONTRACTOR EMERGENCY CONTACTS:

2. State, "This is an emergency."

3. Provide:

- Your name, region, and site.
- Your telephone number.
- Your location.
- Name of injured or exposed person.
- Nature of the emergency.
- Action(s) taken.

a.	E & E Emergency Response Center:	716/684-8940
b.	Corporate Health and Safety Director, Dr. Paul Jonmaire:	716/684-8060 (office) 716/655-1260 (home)
c.	Corporate Safety Officer, Tom Steiner	716/684-8060 (office) 716/662-4740 (home)

10.6 OTHER EMERGENCY RESPONSE PROCEDURES

On-Site Evacuation Signal/Alarm (must be audible and perceptible above ambient noise and light levels): AIR BLAST

On-Site Assembly Area: COMMAND POST

Emergency Egress Route to Get Off Site: _____

Off-Site Assembly Area: _____

Preferred Means of Reporting Emergencies: Cell phone 911

Site Security and Control: In an emergency situation, personnel will attempt to secure the affected area and control site access.

Emergency Decontamination Procedures: Dry Decon

PPE: Personnel will don appropriate PPE when responding to an emergency situation. The SSO and Section 7 of this plan will provide guidance regarding appropriate PPE.

Emergency Equipment: Appropriate emergency equipment is listed in Attachment 1. Adequate supplies of this equipment shall be maintained in the support area or other approved work location.

Incident Reporting Procedures: call 415 777-2811 (Thompson Chambers or Cindy Jones)

ATTACHMENT 1
EQUIPMENT/SUPPLIES CHECKLIST

INSTRUMENTATION	No.	EMERGENCY EQUIPMENT	No.
OVA		First aid kit	1
Thermal desorber		Stretcher	
O_2/explosimeter w/cal. kit		Portable eye wash	
Photovac tip		Blood pressure monitor	
HNu (probe: _____eV)		Fire blanket	
Magnetometer		Fire extinguisher	1
Pipe locator		Thermometer (medical)	
Weather station		Spill kit	
Draeger tube kit (tubes: Hydrocyanic Acid)	1		
Brunton compass	1		
Real-time cyanide monitor	1		
Real-time H_2S monitor			
Heat stress monitor			
Noise equipment		**DECONTAMINATION EQUIPMENT**	
Personal sampling pumps and supplies		Wash tubs	1
MiniRam dust monitor	1	Buckets	1
Mercury monitor		Scrub brushes	2
Spare batteries (type: _____)		Pressurized sprayer	1
Spectrace 9000 XRF	1	Spray bottle	
Trimble GIS system	1	Detergent (type: TSP)	1
RADIATION EQUIPMENT/SUPPLIES		Solvent (type: _____)	
Documentation forms		Plastic sheeting	1 roll
Portable ratemeter		Tarps and poles	
Scaler/ratemeter		Trash bags	1 box
1" NaI gamma probe		Trash cans	
2" NaI gamma probe		Masking tape	
ZnS alpha probe		Duct tape	2 rolls
GM pancake probe		Paper towels	2 box
Tungsten-shielded GM probe		Face mask	3
Micro R meter		Face mask sanitizer	Box
Ion chamber		Step ladders	
Alert monitor		Distilled water	
Pocket dosimeter		Deionized water	1
Dosimeter charger			
Radiation warning tape			
Radiation decon supplies			
Spare batteries (type: _____)			

ATTACHMENT 1
EQUIPMENT/SUPPLIES CHECKLIST

SAMPLING EQUIPMENT		MISCELLANEOUS (Cont.)	
8-oz. bottles	✓	Gatorade or equivalent	✓
Half-gallon bottles		Tables	✓
VOA bottles		Chairs	✓
String	✓	Weather radio	
Hand bailers		Two-way radios	
Thieving rods with bulbs		Binoculars	✓
Spoons		Megaphone	
Knives		Cooling vest	
Filter paper		Air horn	✓
Bottle labels	✓		
5-gallon containers	✓		
1-liter polys	✓		
4-oz jars	✓		
		SHIPPING EQUIPMENT	
		Coolers	✓
MISCELLANEOUS		Paint cans with lids, 7 clips each	
Pump		Vermiculite	✓
Surveyor's tape	✓	Shipping labels	✓
100' Fiberglass tape		DOT labels:	
300' Nylon rope		"Up"	✓
Nylon string	✓	"Danger"	
Surveying flags	✓	"Inside Container Complies ..."	✓
Camera	✓	Hazard Group	
Film	✓	Strapping tape	
Bung wrench		Baggies	✓
Soil auger	✓	Custody seals	✓
Pick		Chain-of-custody forms	✓
Shovel	✓	Federal Express forms	✓
Catalytic heater		Clear packing tape	✓
Propane gas		Permanent markers	✓
Banner tape			
Surveying meter stick	✓		
Chaining pins and ring			
Logbooks (_____ large, _____ small)	✓		
Required MSDSs			
Intrinsically safe flashlight	✓		
Potable water	✓		

HEAT STRESS PREVENTION AND TREATMENT

Elevated temperatures are potentially hazardous, especially when work is conducted without appropriate precautions. The following sections describe heat stress prevention and the recognition and treatment of heat emergencies.

Effects of Heat

A predictable amount of heat is generated as a result of normal oxidation processes within the body. If heat is liberated rapidly, the body cools to a point at which the production of heat is accelerated, and the excess heat brings the body temperature back to normal.

Interference with the elimination of heat leads to its accumulation and to the elevation of body temperature. This condition produces a vicious cycle in which certain body processes accelerate and generate additional heat. Afterward, the body must eliminate not only the heat that is normally generated but also the additional quantities of heat.

Most body heat is brought to the surface by the bloodstream and escapes to cooler surroundings by conduction and radiation. If moving air or a breeze strikes the body, additional heat is lost by convection. When the temperature of the surrounding air becomes equal to or rises above the body temperature, all the heat must be lost by vaporization of the moisture or sweat from skin surfaces. As the air becomes more humid (contains more moisture), vaporization from the skin decreases. Weather conditions including high temperatures (90 to 100 degrees F), high humidity, and little or no breeze cause the retention of body heat. Such conditions or a succession of such days (a heat wave) increase the chances of a medical emergency due to heat.

Preventing Emergencies Due to Heat

When working in situations where the ambient temperatures and humidity are high, and especially in situations where protection levels A, B, or C are required, the site safety officer should:

- Ensure that all employees drink plenty of fluids (Gatorade or its equivalent);
- Ensure that frequent breaks are scheduled so overheating does not occur; and
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 11:00 a.m. and 6:00 p.m. to nightfall).

When protective clothing is required, the suggested guidelines correlating ambient temperature and maximum wearing time per excursion are:

Ambient Temperature	Maximum Wearing Time per Excursion
Above 90 degrees F	15 minutes
85 to 90 degrees F	30 minutes
80 to 85 degrees F	60 minutes
70 to 80 degrees F	90 minutes

60 to 70 degrees F	120 minutes
50 to 60 degrees F	180 minutes

One method of measuring the effectiveness of an employee's rest-recovery regime is by monitoring the heart rate. The "Brouha guideline" is one such method and is performed as follows:

- Count the pulse rate for the last 30 seconds of the first minute of a 3-minute period, the last 30 seconds of the second minute, and the last 30 seconds of the third minute; and
- Double each result to yield beats per minute.

If the recovery pulse rate during the last 30 seconds of the first minute is 110 beats/minute or less, and the deceleration between the first, second, and third minutes is at least 10 beats/minute, then the work-recovery regime is acceptable. If the employee's rate is above the rate specified, a longer rest period will be required, accompanied by an increased intake of fluids.

Heat Emergencies

Heat Cramps. Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps in leg and abdominal muscles. Heat cramps may also result from drinking iced water or other drinks either too quickly or in too large a quantity. The symptoms of heat cramps are:

- Painful muscle cramps in legs and abdomen;
- Faintness; and
- Profuse perspiration.

To provide emergency care for heat cramps, move the patient to a cool place. Give him or her sips of liquids such as Gatorade or its equivalent. Apply manual pressure to the cramped muscle. Move the patient to a hospital if there is any indication of a more serious problem.

Heat Exhaustion. Heat exhaustion also may occur in individuals working in hot environments and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The heat is transported from the interior of the body to the surface by the blood. The skin vessels become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood that is pooled in the lower extremities when in an upright position, may lead to an inadequate return of blood to the heart and eventual physical collapse. The symptoms of heat exhaustion are:

- Weak pulse;
- Rapid and usually shallow breathing;
- Generalized weakness;
- Pale, clammy skin;

- Profuse perspiration;
- Dizziness/faintness; and
- Unconsciousness.

To provide emergency care for heat exhaustion, move the patient to a cool place and remove as much clothing as possible. Have the patient drink cool water, Gatorade, or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock and move him or her to a medical facility if there is any indication of a more serious problem.

Heat Stroke. Heat stroke is a profound disturbance of the heat-regulating mechanism and is associated with high fever and collapse. It is a serious threat to life and carries a 20% mortality rate. Sometimes this condition results in convulsions, unconsciousness, and even death. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) increase the chance of heat stroke. Alcoholics are extremely susceptible. The symptoms of heat stroke are:

- Sudden onset;
- Dry, hot, and flushed skin;
- Dilated pupils;
- Early loss of consciousness:
- Full and fast pulse;
- Deep breathing at first, followed by shallow or faint breathing;
- Muscle twitching, growing into convulsions; and
- Body temperature reaching 105 to 106 degrees F or higher.

When providing emergency care for heat stroke, remember that it is a life-threatening emergency. Transportation to a medical facility should not be delayed. Move the patient to a cool environment, if possible, and remove as much clothing as possible. Ensure an open airway. Reduce body temperature promptly by dousing the body with water or, preferably, by wrapping the patient in a wet sheet. If cold packs are available, place them under the arms, around the neck, at the ankles, or any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions.

COLD STRESS PREVENTION AND TREATMENT

Cold temperatures are potentially hazardous, especially when work is conducted without appropriate precautions. The following sections describe cold stress prevention and the recognition and treatment of cold stress emergencies.

Preventing Emergencies Due to Cold Stress

When working in situations where the ambient temperature is low, especially if low temperatures are accompanied by windy conditions, personnel should use the following cold-stress prevention measures:

- Wear warm, dry, loose-fitting clothing that is preferably worn in layers. Outer clothing should be waterproof and windproof. Inner clothing should be capable of retaining warmth even when it is wet (e.g., wool or polypropylene) or have wicking capabilities (to draw moisture and perspiration away from the skin).
- Wear lined and insulated footwear and warm gloves or mittens.
- Alternately remove and don clothing layers as necessary to regulate body temperature and reduce excess perspiration.
- Drink warm fluids as often as desired.
- Take frequent breaks to provide for cold stress monitoring.

Cold Stress Emergencies

Hypothermia. Exposure to cold can cause the body's internal temperature to drop to a dangerously low level. Hypothermia occurs when a person's body loses heat faster than it can be produced. The body's normal deep-body temperature is approximately 98.6 degrees Fahrenheit. If body temperature drops to 95 degrees Fahrenheit, uncontrollable shivering may occur. If cooling continues, these other symptoms may occur:

- Vague, slow, slurred speech;
- Forgetfulness, memory lapses;
- Inability to use hands;
- Frequent stumbling;
- Drowsiness;
- Exhaustion, collapse;
- Unconsciousness; and
- Death.

Hypothermia impairs the judgment of the victim. Hypothermia is possible even in temperatures above freezing and can be prevented by remaining warm and dry and avoiding overexposure to the cold.

If a person shows symptoms of hypothermia, perform the following:

- Remove the victim from exposure to wet and cold weather.
- Remove wet clothing.
- If the victim is only mildly affected, provide warm drinks and dry clothing.
- If the victim is more seriously affected (clumsy, confused, unable to shiver), begin safe-warming procedures such as hugging, wrapping in dry blankets, and the use of warm objects such as hot water bottles or heat packs, and arrange for evacuation. Do not give the victim warm drinks until he or she exhibits a clear level of consciousness and appears to be warming up.

Frostbite. Frostbite occurs when body tissue freezes. Severe frostbite can lead to reduced circulation and the possible need for amputation. To prevent frostbite, maintain good circulation and keep extremities warm and dry. In extreme cold, it is important to prevent heat loss from as many areas of the body as possible. Exposed limbs and the head are major areas of heat loss.

Tall, thin people; those in poor physical condition; people with chronic diseases; heavy smokers; children; the elderly; and those who have been drinking alcohol are more susceptible to frostbite than other people due to poor circulation, poor production of body heat, or both.

There may be no pain or numbness experienced with gradual freezing of body tissues. While in the cold, it is important to test extremities for sensation and ensure that clothing is loose-fitting and warm. Exposed parts of the body should be inspected routinely. Just before freezing, skin becomes bright red. As freezing continues, small white patches will appear and the skin will become less elastic, often remaining pitted after it is touched or squeezed.

Serious freezing is most common in the feet because people are less aware of them, circulation and sensation are poorer, and warm footwear is difficult to obtain. Hands are usually the next to freeze. Exposed parts of the head will freeze less rapidly because they are conditioned to exposure and have a better blood supply.

In very cold weather, avoid touching cold metal with bare body parts. In the event that this happens, release the skin gently using heat, warm water, or urine. Avoid handling gasoline, kerosene, or similar liquids which, when handled in cold weather, can cause immediate frostbite.

If a person shows symptoms of frostbite, consult a medical professional, if possible, and perform the following:

- Initiate rewarming only if subsequent refreezing is not a possibility (thawing and refreezing should always be avoided because this is very injurious to tissue). Rewarm body parts in water that is approximately 100 to 105

degrees Fahrenheit. Do not try to thaw the body parts using cold water, snow, or intense heat from fires or stoves. The whole body may be immersed in warm water if necessary.

- If a large portion of an extremity is frozen when rewarming is initiated, the deep body temperature may drop as cooled blood begins to circulate throughout the body. Provide warm liquids to alleviate this situation.

- Move the afflicted part gently and voluntarily during rewarming.

- Use pain medication if it is available. Rewarming can be acutely painful. After thawing is completed, a deep pain may persist for several days, depending on the severity of the frostbite. Pain may be a good sign as it indicates that nerve function is present.

- A dull purple color, swelling, or blisters indicate serious injury and the need for medical attention. Consult a medical professional.

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DAILY SAFETY MEETING RECORD

GENERAL INFORMATION

Project:

Project No: | TDD/PAN No.:

Project Location:

Date: | Time: | Weather:

Specific Location:

Planned Activities:

SAFETY TOPICS PRESENTED

Chemical Hazards Update:

Physical Hazards Update:

Radiation Hazards Update:

Review of Previous Monitoring Results:

Protective Clothing/Equipment Modifications:

Special Equipment/Procedures:

Drilling Safety Issues (including testing the operation of drill rig emergency stop switches):

Emergency Procedures:

Additional Topics/Observations:

Team Members' Comments/Suggestions:

DAILY SAFETY MEETING RECORD

INITIAL PROJECT SAFETY CHECKLIST

1. Emergency information reviewed? ____ and made familiar to all team members? _____
2. Route to nearest hospital driven? ___ and its location known to all team members? ___
3. Health and safety plan readily available and its location known to all team members? ___
4. E & E Drilling SOP on site? ___ and available for team member review? ___

ATTENDEES

Meeting shall be attended by all personnel who will be working within the exclusion area. Daily informal update meetings will be held prior to work and when site tasks and/or conditions change.

Name (Printed)	Name (Signature)	Date	Representing (Company/Agency)
Meeting Conducted By:			

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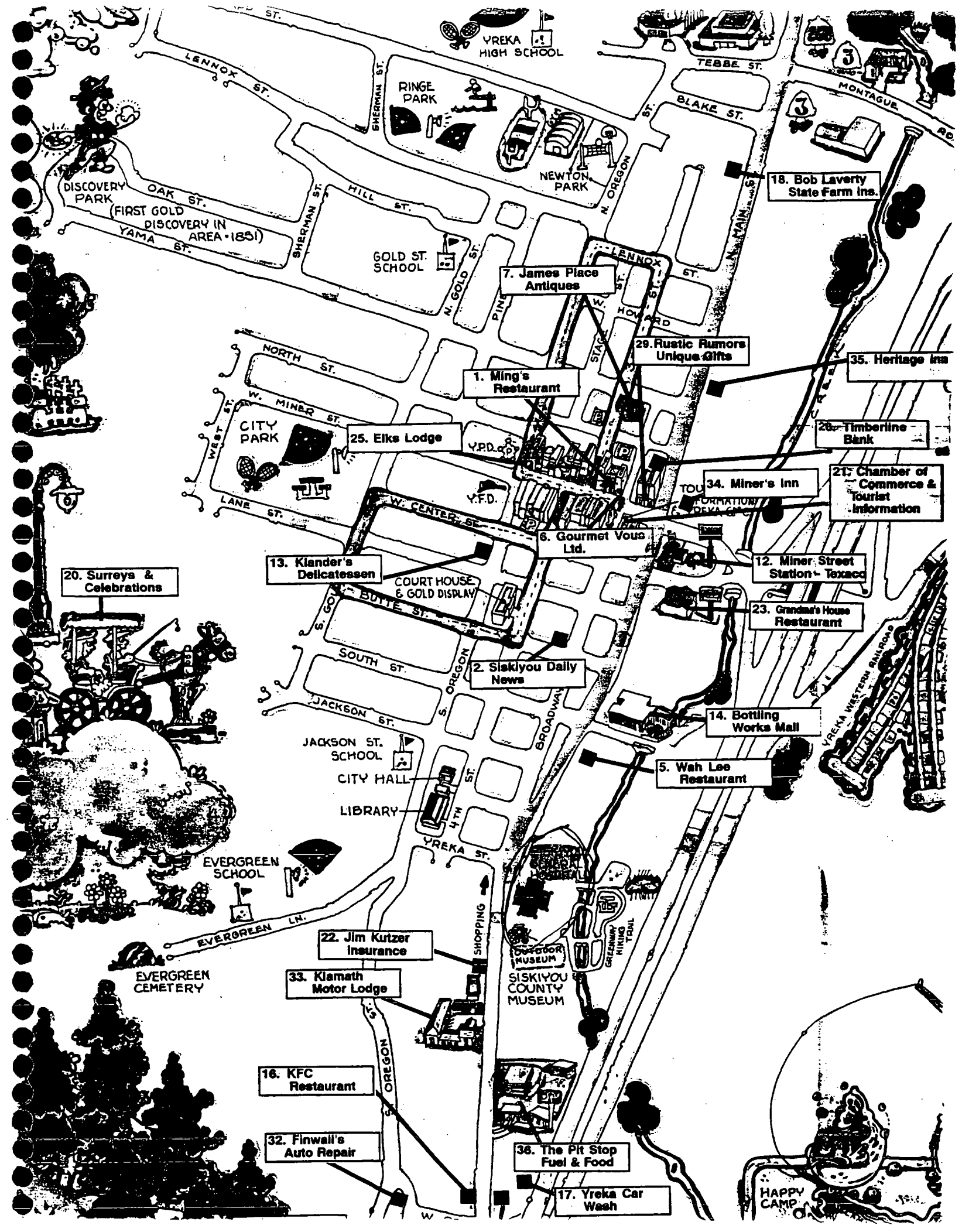
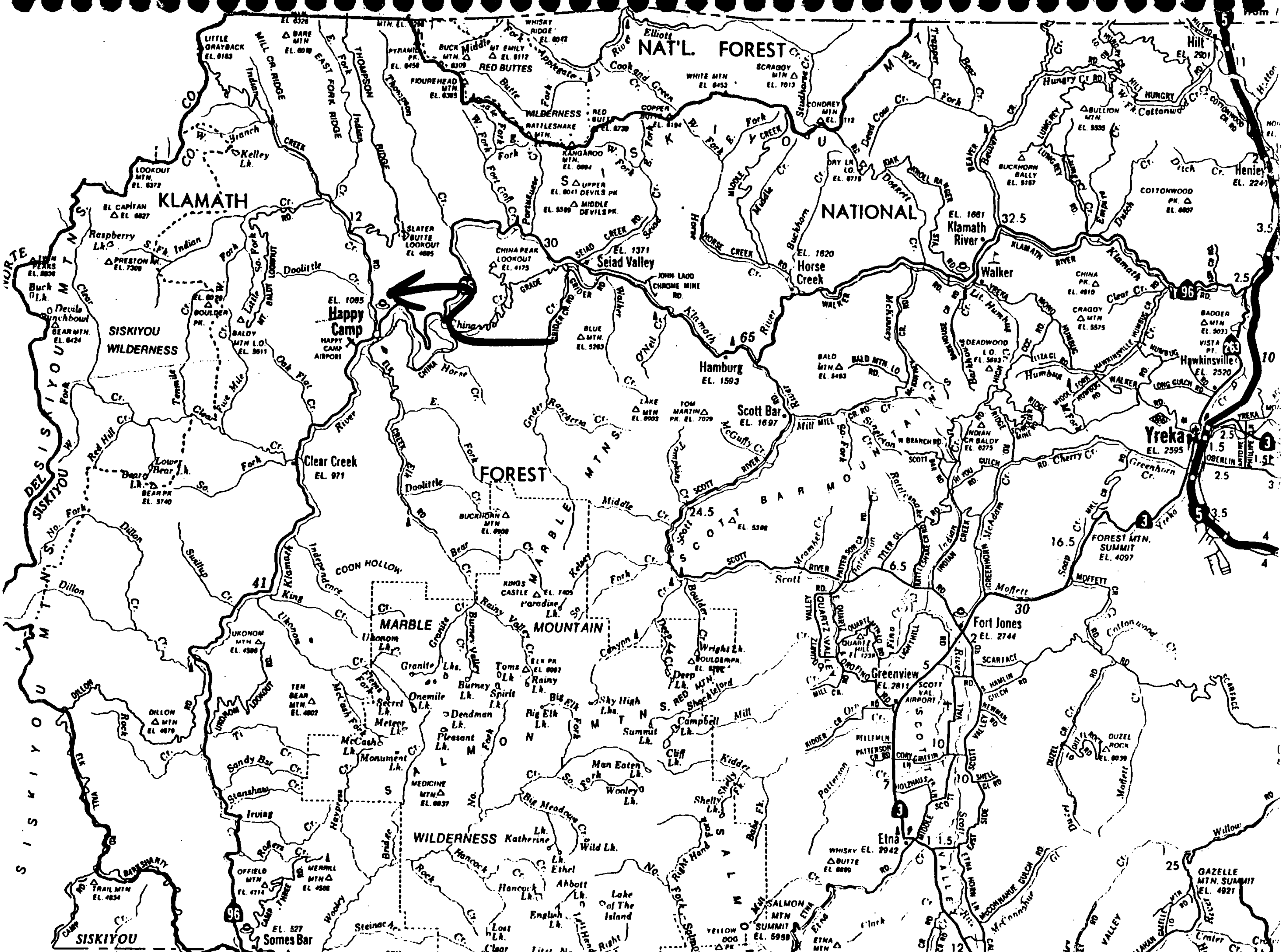
SITE-SPECIFIC HEALTH AND SAFETY PLAN ACCEPTANCE

Project:	
Project No.:	TDD/PAN No.:
Project Location:	
Project Manager:	Project Director:

The undersigned acknowledge that they have read and understood and agree to abide by the health and safety plan.

Name (Printed)	Name (Signature)	Date


YREKA HIGH SCHOOL
LENNOX ST.
SHERMAN ST.
RINGE PARK
TEBBE ST.
BLAKE ST.
MONTAGUE
DISCOVERY PARK
OAK ST.
(FIRST GOLD DISCOVERY IN AREA - 1851)
YAMA ST.
HILL ST.
NEWTON PARK
N. OREGON
N. MAIN ST.
GOLD ST. SCHOOL
N. GOLD ST.
PINE ST.
W. LENNOX ST.
W. HOWARD ST.
STAGE RD.
NORTH ST.
W. MINER ST.
WEST ST.
CITY PARK
LANE ST.
Y.P.D.
Y.F.D.
W. CENTER ST.
COURT HOUSE & GOLD DISPLAY
S. GOLD ST.
BUTTE ST.
SOUTH ST.
S. OREGON
JACKSON ST.
BROADWAY
JACKSON ST. SCHOOL
CITY HALL
LIBRARY
4TH ST.
YREKA ST.
EVERGREEN SCHOOL
EVERGREEN LN.
EVERGREEN CEMETERY
SHOPPING
OUTDOOR MUSEUM
GREENWAY HIKING TRAIL
SISKIYOU COUNTY MUSEUM
YREKA WESTERN RAILROAD
HAPPY CAMP
18. Bob Laverty State Farm Ins.
7. James Place Antiques
29. Rustic Rumors Unique Gifts
35. Heritage Inn
1. Ming's Restaurant
25. Elks Lodge
28. Timberline Bank
34. Miner's Inn
21. Chamber of Commerce & Tourist Information
6. Gourmet Vous Ltd.
12. Miner Street Station - Texaco
13. Klander's Delicatessen
20. Surreys & Celebrations
23. Grandma's House Restaurant
2. Siskiyou Daily News
14. Bottling Works Mall
5. Wah Lee Restaurant
22. Jim Kutzer Insurance
33. Klamath Motor Lodge
16. KFC Restaurant
32. Finwall's Auto Repair
36. The Pit Stop Fuel & Food
17. Yreka Car Wash



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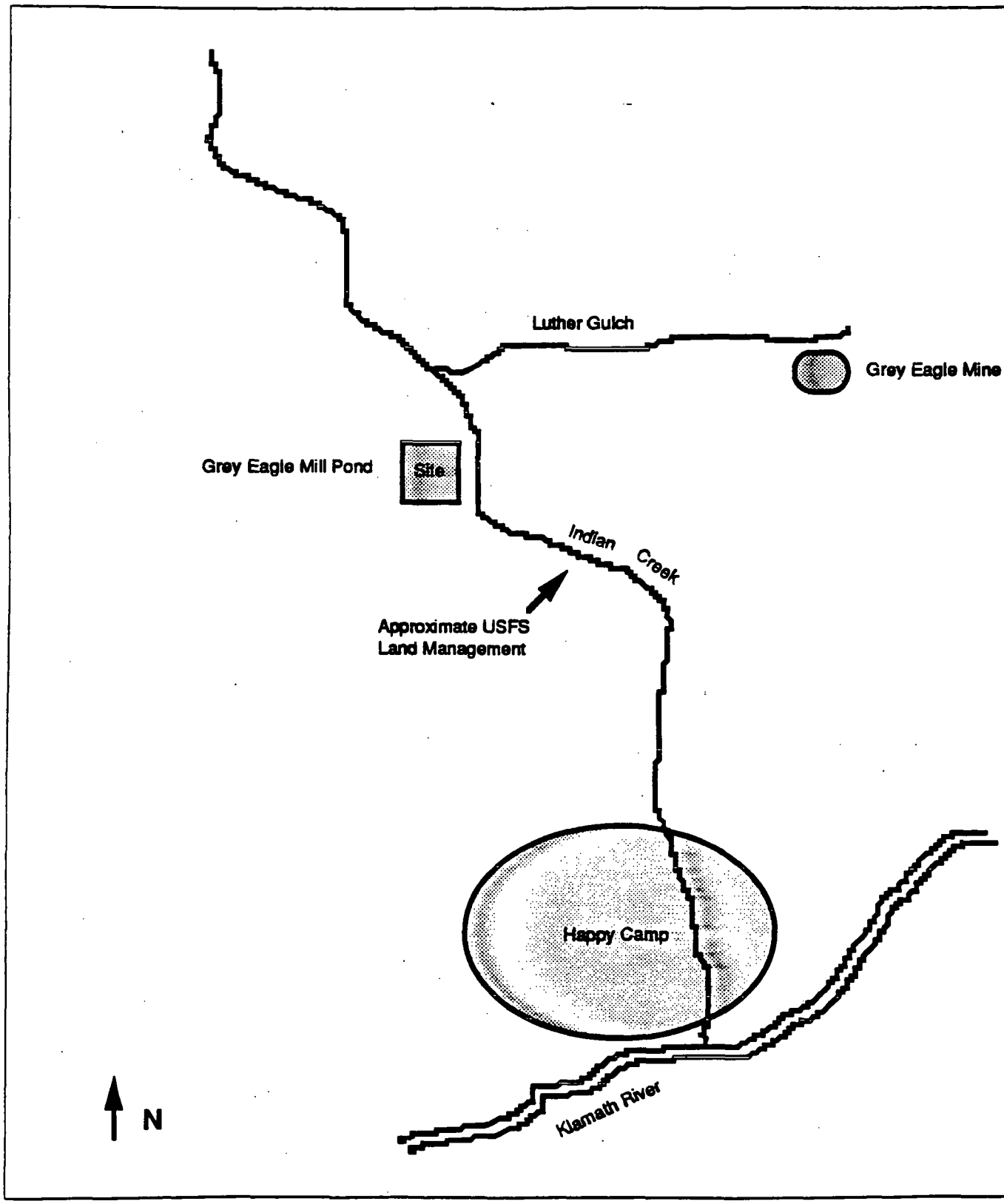

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Figure 2

SAMPLE LOCATION MAP

Grey Eagle Mine
Talling/Pond Site
Happy Camp, CA

D

Contact Log and Reports

CONTACT REPORT

Grey Eagle Mine Site, Siskiyou County, California

EPA ID No. CAD000629923

Name	Affiliation	Telephone	Date	Information
David Evans, Water Engr.	RWQCB	(707) 576-2703	3/19/99	Water treatment facility on Luther Gulch, pilot programs for AMD at the mine
Polly Haessig, Geologist	USFS	(530) 841-4415	12/7/99	USFS involvement with the site, fishing, water use, Luther Gulch

CONTACT REPORT

Grey Eagle Mine Site, Siskiyou County, California

EPA ID No. CAD000629923

Name:	Polly Haessig, Forest Geologist
Agency:	U.S. Department of Agriculture Forest Service, Klamath National Forest
Telephone:	(530) 841-4415
Date:	December 7, 1999
Contact by:	Tim Colen, START

Information:

Ms. Haessig said that although the California Department of Fish and Game became involved with the Grey Eagle in the 1950s, they have not been active with the site in recent years. In addition, she is not aware of any regulatory activity by California Department of Toxic Substances Control at the Grey Eagle Mine site. The 0.3 acre of land along Indian Creek belongs to the Forest Service which has CERCLA authority over it. The Forest Service appointed an on-scene coordinator with authority to manage its interests in the property, particularly during previous EPA investigations and during the removal action conducted by EPA's Emergency Response Office in September 1998.

The Town of Happy Camp obtains its drinking water from surface water intakes from Elk Creek, a north-flowing tributary of the Klamath River, south of the town.

The water treatment facility in Luther Gulch was built in 1986-7 by the responsible parties named the Regional Water Quality Control Board's cleanup and abatement order. She said that she is not aware of any water quality problems in Luther Gulch since it was built.

She did not have information on recreational or subsistence fishing in Indian Creek since it is supposed to be closed to all fishing.

CONTACT REPORT

Grey Eagle Mine Site, Siskiyou County, California

EPA ID No. CAD000629923

Name:	David Evans, Water Resource Engineer
Agency:	California Regional Water Quality Control Board, North Coast Region
Telephone:	(707) 576-2703
Date:	March 19, 1999
Contact by:	Tim Colen, START

Information:

Mr. Evans has been the Regional Water Quality Control Board's (RWQCB's) project officer for the Grey Eagle Mine site for several years and has visited the site frequently. The water treatment facility on Luther Gulch was built by Noranda Mining Company in about 1986-7 to address the severe water quality problems that existed in the creek due to mining activities associated with the Grey Eagle Mine. The effluent is sampled monthly under the terms of the cleanup and abatement order. He is not aware of any compliance problems with the facility's discharge.

The plant's operators are dissatisfied with its high operation and maintenance costs and are interested in testing new technologies that could mitigate the acid mine drainage (AMD) within the underground workings. He said they are interested in RWQCB approval of a pilot program to inject lime slurry into mine openings for *in situ* treatment of AMD that would also eventually plug the openings with the metal oxide precipitates.